August 1979

# Smithsonian

## Pilot project to halt the desert (p. 32)

In Tunisia, a darkling beetle scurries for cover, its prints crisscrossing track of lizard's tail

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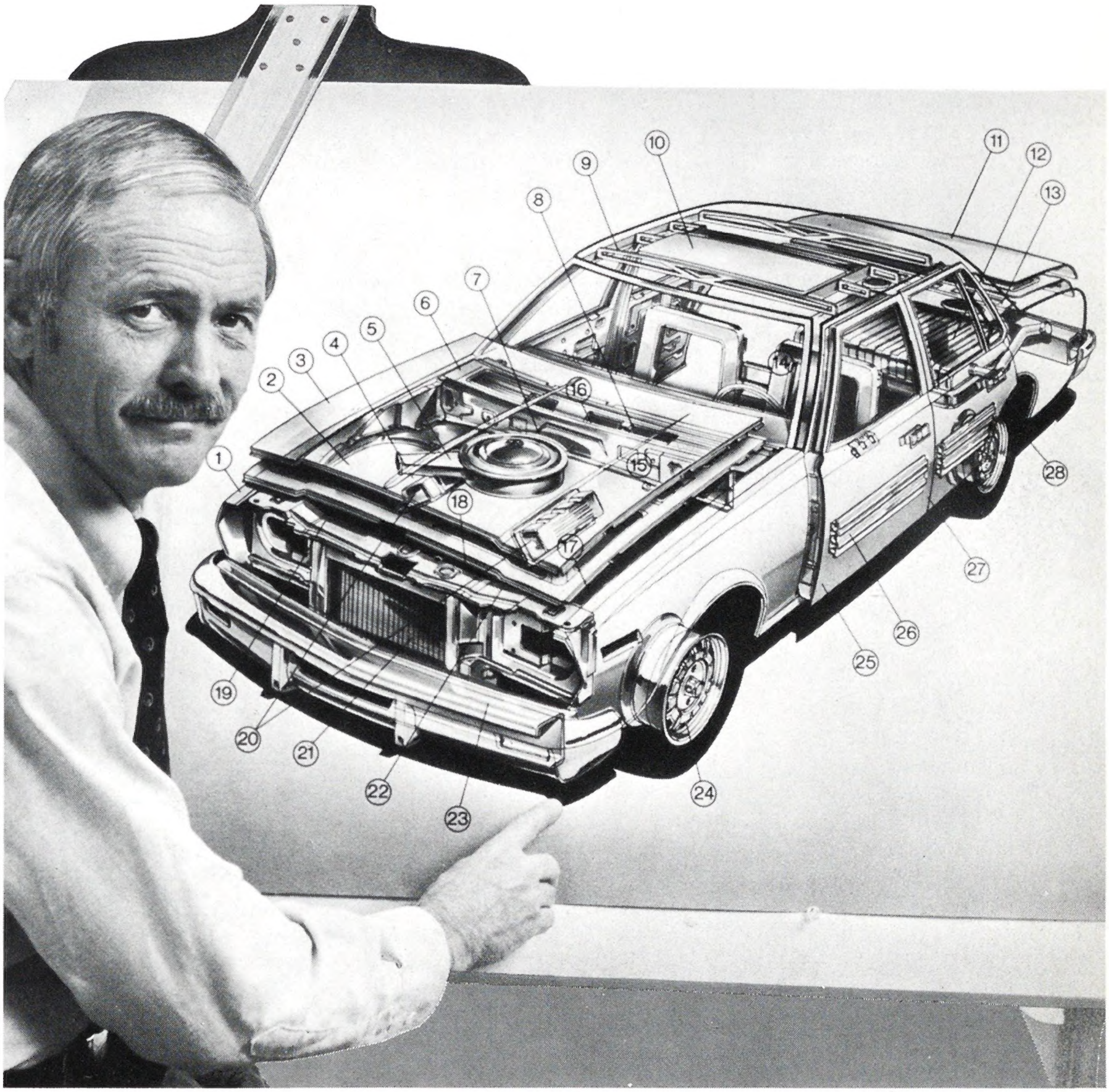

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*Smithsonian* (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, D.C. 20560.
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Subscription price $12 a year in U.S. and possessions, $15.50 elsewhere.
Single copy price $1.25.
Second-class postage paid at Washington, D.C.
Editorial offices, 900 Jefferson Drive, Washington, D.C. 20560.
Advertising and circulation offices at 420 Lexington Ave., New York, New York 10017.
Please address all subscription correspondence and change of address information to P.O. Box 2955, Boulder, Colo. 80322

*August 1979*

# Smithsonian

Volume 10, Number 5

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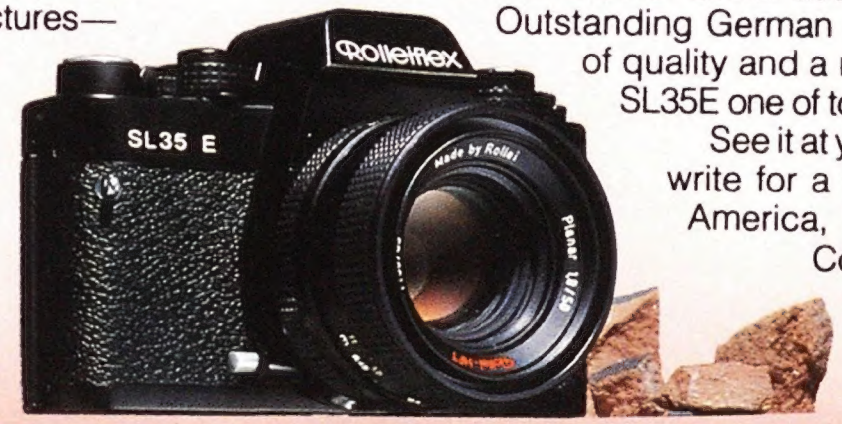


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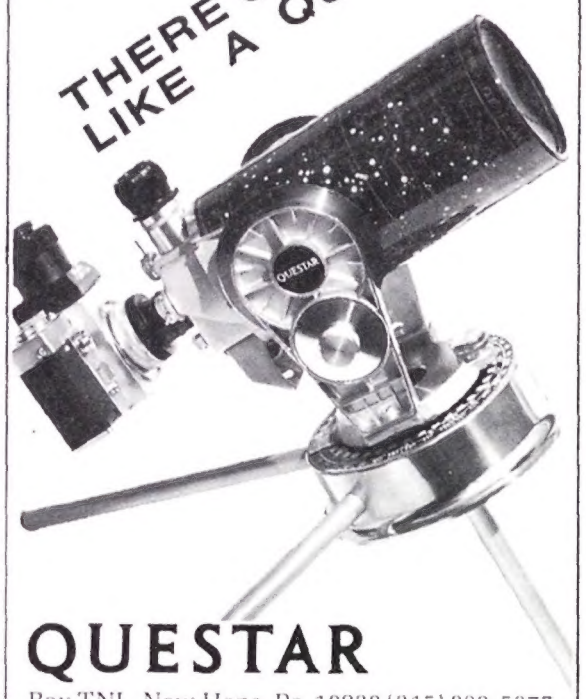


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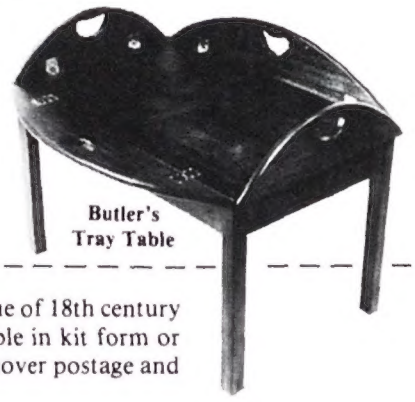

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Simulated situation based on actual incident.

# "THANK GOD AND THANK VOLKSWAGEN."

And we thank Brian Regrut for writing us the following letter about his Dasher.

Gentlemen:

Please pass along my thanks for your negative steering axis (or whatever it is called) to your engineers back in Germany. It helped keep me out of big, big trouble.

Many West Virginia roads, particularly those in the southern part of the state are bad. Unfortunately, I have to travel these roads during the course of my business.

Fortunately, I occasionally drive the mountains in my Dasher. (I usually drive a big company car.) The Dasher's size affords me the luxury of staying on the road when a coal truck passes in the other direction. And in the Dasher, I've always been able to dodge pot holes without spinning out of control, and to traverse the roads in bad weather with assurance.

Traveling home recently on these bad roads, the sidewall of my left front tire blew out while I was driving at about 50 miles an hour. Faced with on-coming traffic on the left and a steep drop off the pavement on the right (40 feet down through the trees to the river), I braced for the worst. It never came. In fact I had little trouble maintaining control as I slowed to about 10 miles an hour and drove for about a quarter mile to a tiny spot where I could get most of the car off the road.

Finally, I was back on the road, thanking God that He was with me during the emergency, and thanking Volkswagen for designing a front end that helped me stay on the road.

With warm thanks,

Brian Regrut

**VOLKSWAGEN DOES IT AGAIN**

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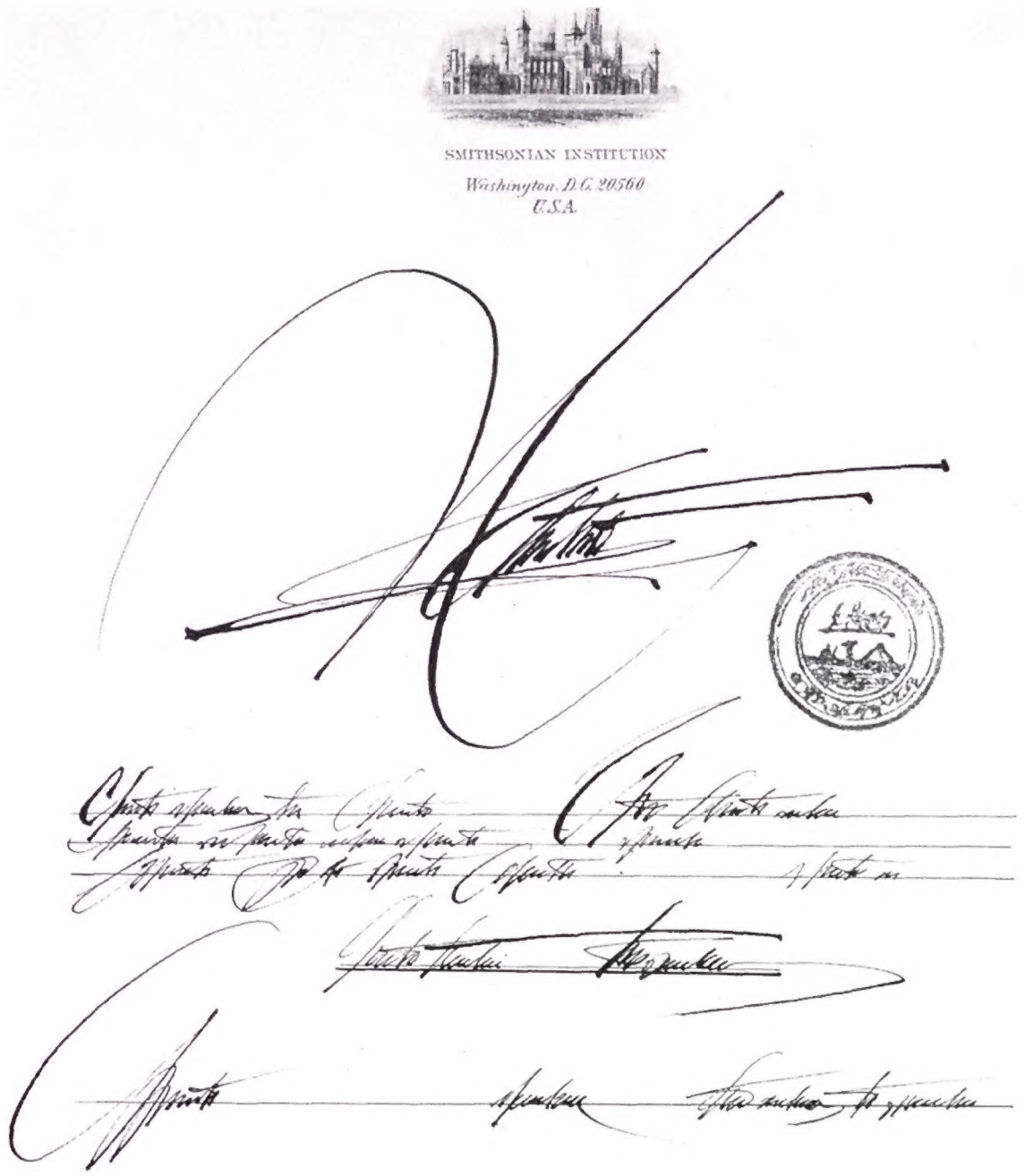
# *The view from the castle*

From time to time it is customary for art galleries or museums to celebrate the opening of an exhibition with a dinner. Nowadays this has become an extremely expensive ritual, and the persistence of the tradition is at risk. If the dinner is given at all, a second hurdle is to make it successful. How can it be prepared and served for a large number, but done in such a way as to imply no strain, no sense of hurry? Rather, the occasion must have grace and ease.

Once upon a time we had a dinner at the Hirshhorn Museum for the opening of a retrospective show of paintings, drawings and constructions by Saul Steinberg. I remember the tables were beautiful: candles shone, silver gleamed, tablecloths and napkins had the crisp matte finish of the finest lawn. One element that seemed to set the seal on the occasion was the presence of menu cards—stiff, white, four by six inches, with beveled gold edges—on which was embossed the Smithsonian seal, "a sun in its splendor" in the language of heraldry. Below, in deft calligraphic strokes, the menu of the evening was set forth, along with the date and the occasion. In the lower left corner was a list of the wines.

The menu card was a work of art in itself. It enhanced and glorified the dinner. Fortunately, the catered food arrived hot and succulent, each dish giving the impression that it had never felt the bland "preservation" of a steam table. For once—it doesn't happen often—the food tasted like ambrosia, the wine like nectar. The warm, mellow glow of the lights complimented us all. There was music in the air. As people say nowadays, the "ambience was right."




Steinberg's "menu" on Institution letterhead

Suddenly it struck me that the phrase "form follows substance" was turned about. What really had occurred at this dinner was "substance" following "form." The setting, the detail, the attention paid to form had created the substance. Style is all-important: without it, events such as this become numbing in their banality; the food becomes less acceptable, cold or tasteless, the wine turns sour, the conversation sputters and the glow goes out of the evening.

I noticed Saul Steinberg taking a menu with him at the end. Later I asked him about it. Was it for a keepsake, a memento of this dinner in his honor?

"No, I keep it because it is well done," was the reply. "A menu is important. There used to be a restaurant in Paris, Larue. It had the most beautifully written menus and bills. Only to read the script was to realize that the taste expressed in the menu would be made patent in the delicious food, while good calligraphy on a bill is a politeness and a most elegant way for the *host* to tip the guest.

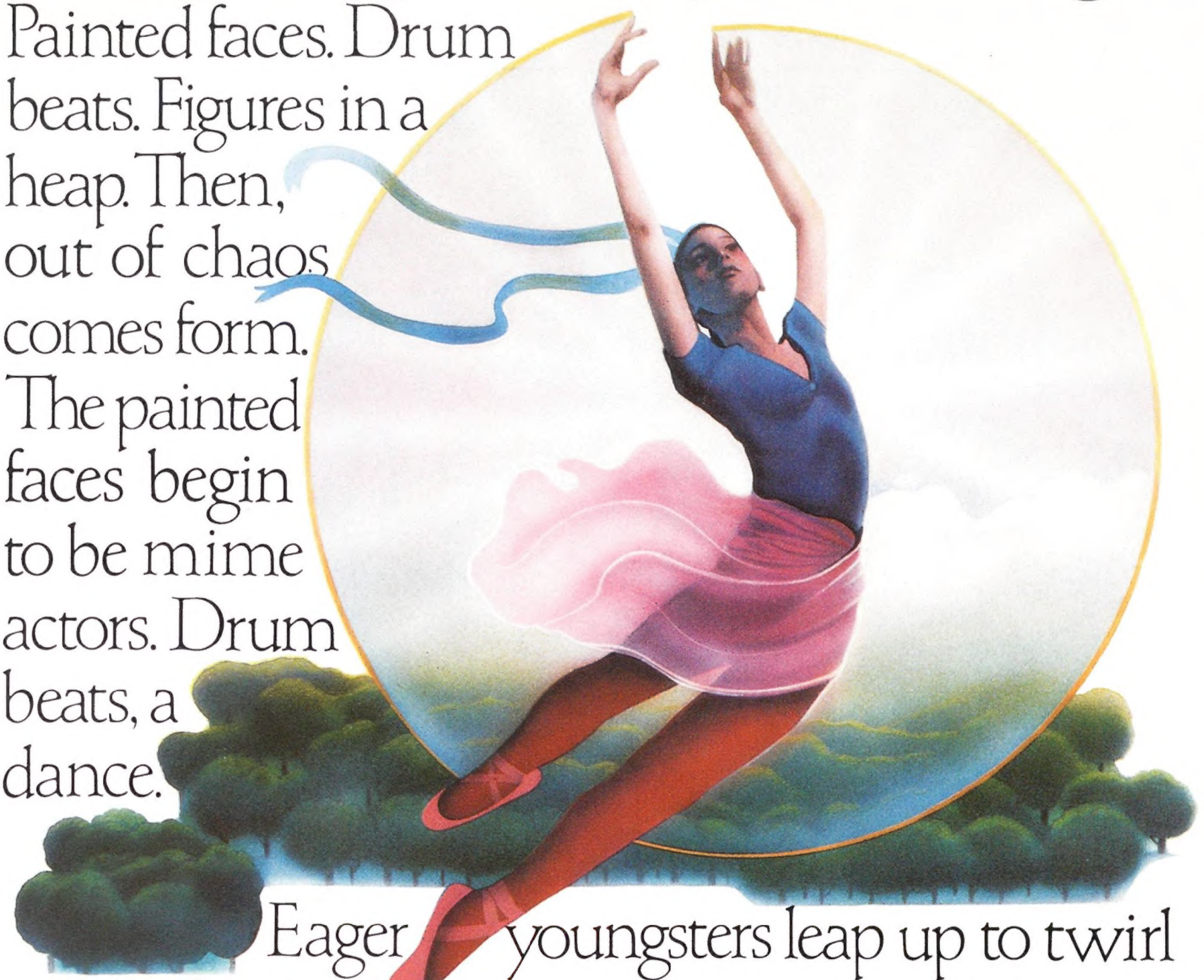
"Some restaurants are impossible," he continued. "To go and sit down and be confronted with a huge menu, on coarse paper, scribbled all over in purple with careless script, ugly and illegible! The food will reflect it."

I wrote Saul Steinberg later and asked him to draw up a menu in his enigmatic and stylish way. The result (above) is handsome, dashing and, of course, unintelligible—as in his best calligraphy the form itself *is* the substance. How many more times will we have a chance to see such a splendid menu?

S. Dillon Ripley

# The young must try their wings.

Painted faces. Drum beats. Figures in a heap. Then, out of chaos comes form. The painted faces begin to be mime actors. Drum beats, a dance.



Eager youngsters leap up to twirl into ballet. And one more time the Oklahoma Summer Arts Institute has worked its magic. Here at Quartz Mountain, teenage winners of a state-wide competition bring their talents to be polished by encouraging instructors. Dance. Acting. Music. Writing. Visual Arts. It's work and it's fun. And Phillips Petroleum gladly gives to its support. Not for money. Just for a song.

PHILLIPS 66

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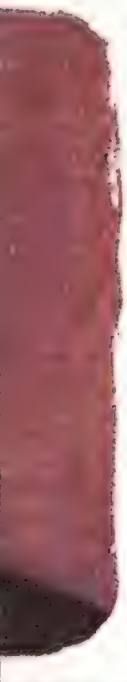
*The hardworking author of 3 books on oil and watercolor techniques, Charles Reid has twice won the coveted Salamagundi Award of the National Academy of Design, as well as that organization's prestigious Julius Halgarten prize; the Henry W. Ranger Award; and two Altman Awards. In 1972, Reid was commissioned to design the Family Planning commemorative stamp, thus adding philatelic design to his considerable credentials. In this original painting Reid has captured the beauty of America's trees with bold splashes of bright autumn colors. (The American Trees commemorative stamp issue shown on this Collector Panel for illustrative purposes was issued in 1978.)*

◀Lift here

this Collector



re displayed in many
including the John F.
on. Here, Handville offers
ennedy—Robert F.—in a
tion of what the man

(The Colorado Statehood commemorative stamp issue shown on this Collector Panel for illustrative purposes was issued in 1977.)

Colorado

*U.S. Commemorative Stamp Collector Panels are issued by the Postal Commemorative Society which is not affiliated with the U.S. Postal Service or any governmental agency. The program starts with the June 1979 U.S. stamp issues. The artists whose original works are shown here for illustrative purposes have also been commissioned to do paintings for forthcoming Collector Panels.

*Dean Ellis was selected by Life magazine as one of nineteen promising American painters. That promise has been fulfilled in paintings such as this striking Colorado landscape, which pulses with the joy of living close to earth and sky.*

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City, State _____ Zip _____

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☐ Master Charge ☐ VISA

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Credit Card Number Expiration Date

Signature _____

*(The Washington at Valley Forge commemorative stamp issue shown on this Collector Panel for illustrative purposes was issued in 1977.)*

*Valley Forge*

*American poet Carl Sandburg said that William Smith's paintings bore "an inviolable dignity," which is shown on this Collector Panel. It depicts George Washington—in striking, unforgettable detail—as he prays for his army during the harsh winter at Valley Forge.*

*(The Robert F. Kennedy commemorative stamp issue shown Panel for illustrative purposes was issued January 1979.)*

*Robert F. Kennedy*

*Robert Handville's painting private and public collection Kennedy White House Colle a vivid portrayal of another way that deepens our appre contributed to American life*

**Now, a major new, original work of art by a great American artist will combine with each new U.S. Commemorative Postage Stamp to create an heirloom collectible of historic significance and enduring beauty. And you have the opportunity to start your collection from the very first panel, as a Charter Subscriber.**

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Each work of art will be signed on plate by the artist, then meticulously lithographed in full color on specially-crafted paper which has the texture of artist's canvas. Each Panel will be embossed with the 22 karat gold hallmark of the Postal Commemorative Society.

**A handsome portfolio will enhance your collecting enjoyment.**

# *Letters to the Editor*

## *Panthers*

Dear Sir: The illustration of our panther poster that appeared in Michael Frome's article, "Panthers wanted—alive, back East where they belong," in your June issue, caused considerable interest in our attempts to solicit sight reports. In the first two weeks after your article appeared, we received more than a hundred letters and telephone calls from throughout the East. A lot of people are obviously certain that the big cats have returned to some of their former haunts.

Our primary goal was to locate areas in North Carolina where clusters of sightings occurred. This phase of our studies has ended, and we hope that persons who tried to call us collect will understand our unwillingness to accept numerous calls from Maine to California and Canada.
*David S. Lee*
Curator of Birds & Mammals
N.C. State Museum of Natural History
Raleigh

Dear Sir: The sighting of the "large, grayish cat with a long tail" in July 1975 in the Great Smoky Mountains National Park occurred in Cataloochee Valley, a remote area on the N.C. side of the park. This area, its remoteness, and the possibility that it may contain panthers, may be destroyed if the park follows the plan to build a paved access road to I-40, which connects the cities of Knoxville, Tennessee, and Asheville. This road must not be built! It will destroy a valley and its representation of pioneer America.
*Doris B. Hammett*, M.D.
Committee to Save Cataloochee
Waynesville, North Carolina

Dear Sir: The proposed road would have a beneficial effect on wildlife, we believe, providing areas for deer to browse and a habitat for all kinds of small animals and birds. The road must be built! It will provide an unforgettable experience for many Americans to enjoy a visit to a small valley of Pioneer America, where 200 people lived before the land was acquired for the Great Smoky Mountains National Park and where several pioneer homes have been restored.
*David F. Felmet*, chairman
N.C. National Park Parkway and Forests Development Council
Waynesville, North Carolina

Dear Sir: Having carefully and specifically delineated just about every range, area, park, nook and cranny wherein panthers might possibly still be found, your article has done its bit to ensure the total wipeout of the species. Man is indeed the greatest enemy—journalists in particular, it seems.
*Rose A. Thompson*
Albany, Oregon

Dear Sir: I live in Arkansas a half-mile from the Oklahoma border, and I know that there are panthers in these Ozarks. I see panthers now and then, but if you ask most people in this area if there are panthers around here, they would say No. I live in the woods and see many things that the average person never sees.

Sitting on my porch one evening, I heard a panther calling her kittens. Two weeks later I heard her scolding them. The next summer, a truck driver had to stop to keep from running over two panther kittens.
*Lewis Powell*
Siloam Springs, Arkansas

## *The Bradbury Thompson Bible*

Dear Sir: After reading Doris Grumbach's article, "A handsome, poetic new design is wrought for the Great Book," and looking at the marvelous color illustrations, I would like very much to own all three volumes. But since I can't afford to buy them, I hope you can suggest where I might see them.
*Marion Martin*
New York City
*For reader Martin and others who have inquired, this Bible now can be found at: the Library of Congress, Beinecke Rare Book and Manuscript Library at Yale, Hunt Library at Carnegie-Mellon University, Strozier Library at Florida State University and, of course, Washburn University Library in Topeka. The publishers are now testing the feasibility of a less expensive deluxe edition—the same as the original except for reproductions of the Albers prints—and a smaller, less costly third edition.* Ed.

## *Tribalism in Kenya*

Dear Sir: My office colleagues and I spent an entire afternoon discussing the article on tribalism. We found it very educational, but we are curious about the hair style of Samburu warriors on the cover. Does their hair really grow that long, or do they use some type of added decoration?
*Patricia A. Singer*
Houston, Texas
*The length of the hair and the ceremony of dressing it is of great importance to the Samburu, who may spend as much as 15 hours arranging each other's hair into some 400 coils, rubbing into it red ocher pigment and animal fat* [*see below*].

*Some of them add length to their hair by using fibers of doom palm, wild sisal and cotton.* Ed.

## *Chestnut trees*

Dear Sir: Rudolph Chelminski's article on Jean Grente, the French agronomist

# Of course you can afford it. Think of all the money you've saved drinking ordinary Scotch.

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who has succeeded in saving chestnut trees from the blight in France, is partially in error, if 26 large American chestnut trees and several hundred seedlings, saplings and young trees, outside their native range, can be seen as constituting a "stand."

The author writes that the chestnut blight "destroyed every last stand of American chestnuts in just 40 years." However, settlers from the Eastern states established American chestnut trees here in Wisconsin in the mid to late 1800s, and the blight is not known to have entered the state. The stand of trees mentioned, which is the largest in Wisconsin, is located on the Einar Lunde farm in Trempealeau County. One specimen was measured at 11 feet in circumference at breast height and 67 feet in height. It was the national champion American chestnut until one was reported in Oregon City, measuring 15 feet 8 inches in circumference and 90 feet high.

*James R. Batt*, Executive Director
Academy of Sciences, Arts & Letters
Madison, Wisconsin

*The author was referring to the "native" stands of chestnuts in the East, but it is hoped that those in Wisconsin outside the "native range" will escape infection by the blight.* Ed.

Dear Sir: The French effort to control chestnut blight brings to mind Robert Frost's poem "Evil Tendencies Cancel." *

> Will the blight end the chestnut?
> The farmers rather guess not.
> It keeps smoldering at the roots
> And sending up new shoots
> Till another parasite
> Shall come to end the blight.

*Robert Brambl*
Minneapolis

## *Migratory birds*

Dear Sir: In regard to David Zimmerman's fascinating descriptions of migratory birds, I remember an article some 25 years ago in *Scientific American* by the late Dr. James E. McDonald of Iowa State College. Dr. McDonald wrote about a study made by Dr. Henry L. Yeagley, who explored the theory that birds may be guided in their migrations by sensitivity to Coriolis acceleration and geomagnetic latitude. Dr. McDonald was careful to mention that it is a "low *a priori* plausibility," but, nevertheless, added "All things that move over the surface of our spinning earth, whether birds, winds, rivers, ocean currents, explorers, cars, trains, bullets or rockets, are inevitably subjected to this [Coriolis] effect as we view them in our terrestrial coordinate systems. . . . Whether birds are really that clever or not, we may be quite sure that they inexorably tend to drift as they fly."

*S. O. Izlar*
Hixson, Tennessee

Dear Sir: During the mid-Sixties, I worked on the 83rd floor of the Empire State Building, and it was common during darkness to see thousands of birds circling the lighted upper floors of the building. Twice I arrived early in the morning and found hundreds of birds lying dead in the street.

*Cyrus W. Getter*
Tucson

*Officials at the Empire State Building, working closely with the Audubon Society, adjust the lighting on the upper floors twice a year during the migration season. But there have been a few incidents when the system failed to prevent birds from crashing into the building.* Ed.

## *Rum-running*

Dear Sir: Judging by the relative size of the Feds you picture inspecting the largest illegal distillery ever found in Detroit, if they are six feet tall then the vats shown must be 41 inches in diameter and 68 inches high, containing approximately 400 gallons. However, since your caption states that these vats contain 15,000 gallons, the men shown must be truly remarkable, standing some 20 feet tall.

*Dave Yeager*
Miami

*The information accompanying this 1931 picture was in error.* Ed.

## *Phenomena, comment and notes*

Dear Sir: In James K. Page jr.'s item about the green polar bears at the San Diego Zoo, he said that the relationship between the algae and the bears cannot be called symbiotic because the bears apparently don't benefit from it. In fact, the term symbiosis is generally used to cover any form of "living together," a usage which corresponds to the derivation of the word. Therefore, symbiosis includes parasitism, in which one organism lives at the expense of another; mutualism, in

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which both benefit; and commensalism, in which one is benefited and the other is neither helped nor harmed. The relationship between polar bears and algae seems to fall into the third category.
*Jack Komisar*
Baltimore

## *Inebriated birds*

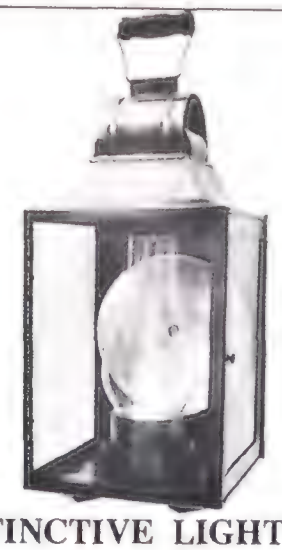
Dear Sir: One statement in John V. Dennis' article, "Are they birds or do we see W. C. Fields in triple vision?", that ruffed grouse in the fall go through the "crazy season" because they are inebriated, I think is nonsense. I found no such evidence in researching my own book, *Grouse and Grouse Hunting*.

Agreed, some birds get smashed on fermented fruit, but the crazy-flight of grouse has nothing to do with tippling. This is a natural dispersion of the young of the year, and it usually occurs well before there are fermented apples around to addle the brains of man, cow or bird.

Immature ruffed grouse have to establish their own territories because there simply isn't room for competition on a natal ground. Therefore, usually in early fall, these immatures get the urge to fly hell-west-and-crooked. They burst out of the family unit like seeds exploding from a pod. In doing so, they run into picture windows, automobiles, trees—or anything else that happens to be in the way.
*Frank Woolner*
Shrewsbury, Massachusetts

Dear Sir: Last spring my mother, who lives in Las Vegas, told us about a robin that got so inebriated from eating fermented pyracantha berries that he would fall off the branch. I suspected her of nipping the cooking sherry, until that same summer when we moved to a place with 25 different fruit trees.

One day I noticed our desert tortoise, Jinx, was acting very strangely. When my husband and I went to his assistance, we discovered he was so smashed that he couldn't make it across the lawn and had to sleep it off under the peach tree. His face and chin were drenched with peach juice, and he looked as though he had found the end of the rainbow's treasure. Jinx enjoyed several weeks of pure ecstasy until his supply of peach brandy dried up for the year.
*Margaret Robinson*
La Canada, California



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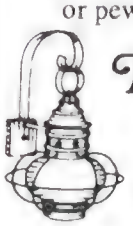

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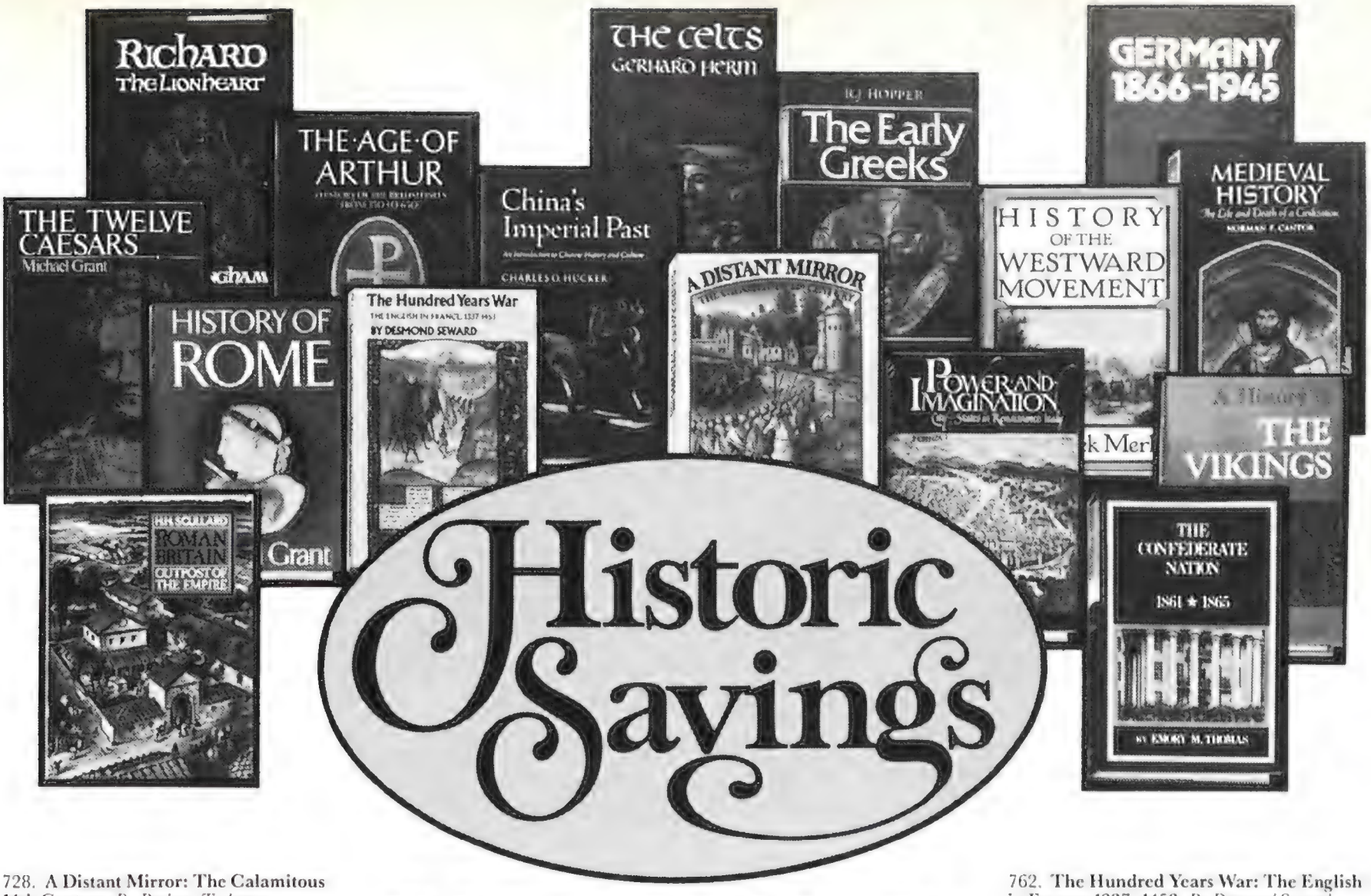


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# *Phenomena, comment and notes*

*Biblical geophysics, businessmen as the first writers, cockroaches and the gerbil role in technology*

A common urge of the engineering profession, the Gargantua syndrome, has been taking its share of knocks lately. The nuclear temple, its walls now cracked, has apparently lost yet more of its congregation. The wobbly construction of the massive DC10 has produced not only tragedy and subsequent anger in airport lines but heebie-jeebies for many about to be airborne. The Alaska pipeline has sprung some leaks, as predicted.

Oil spills from big tankers' casualties, according to Anita Yurchyshyn, chairman of the Sierra Club's Marine Environment Program, tripled between 1974 and 1977. And 1978 was worse by far than 1977. So heavy is the tanker traffic (with attendant risk of spills) from the leaky Alaska pipeline's terminus at Valdez south to the lower 48, that there is some risk that the Canadian otter population, now burgeoning after a three-year transplanting program, could still disappear.

Evidence is beginning to accumulate that high-voltage power lines (such as the 765-kilovolt lines that spiderweb the West) not only make pacemakers do crazy things but have long-term ill effects on people's biochemical circuitry.

Don't get me wrong. There's nothing inherently bad about high technology. How else would it be possible for my daughters to listen to bluegrass and punk rock (or whatever it is now) at 107 decibels? How else will we make solar cells economically? Where else but from high technology would we have got the "chip," that microelectronic device which, *The Futurist* regularly predicts with the certitude of the righteous, will in a year or two relegate such anachronistic items as books and magazines to the same historical junkheap as that which contains the Stanley Steamer. (Isn't it a marvelous thought that one day soon the Smithsonian Institution may mount an exhibit of this magazine, perhaps even this issue, with no pictures, with a recorded voice—not a label—explaining what it is and the quaint process, called reading, by which its data were so cumbersomely retrieved?)

But the recalcitrance of the romantic will prove no substitute for the logical progression of high technology. Night soil is simply out for a sophisticated society. One nevertheless wistfully looks for humble solutions to high-tech problems and, mirabile dictu, one finds a bold initiative in this direction from the Federal Aviation Administration: specifically, gerbils.

With proper Skinnerian indoctrination, gerbils, it is hoped, will be able to learn to press a button that will sound the alarm every time their sensitive little noses sniff out the presence of explosives. Coupled to the metal detector at your neighborhood airport, these humble beasts may wind up being part of the answer to the worldwide epidemic of terrorism. It's a nice thought . . . one that could perhaps be taken a step or two further.

Relatively prolific (one hesitates to say they are fast breeders), gerbils could be placed in little colonies around nuclear power plants. When the gerbil offspring begin to look a little weird (no doubt someone can come up with a quantifiable measure of weirdness), then it's time to shut off the reactor.

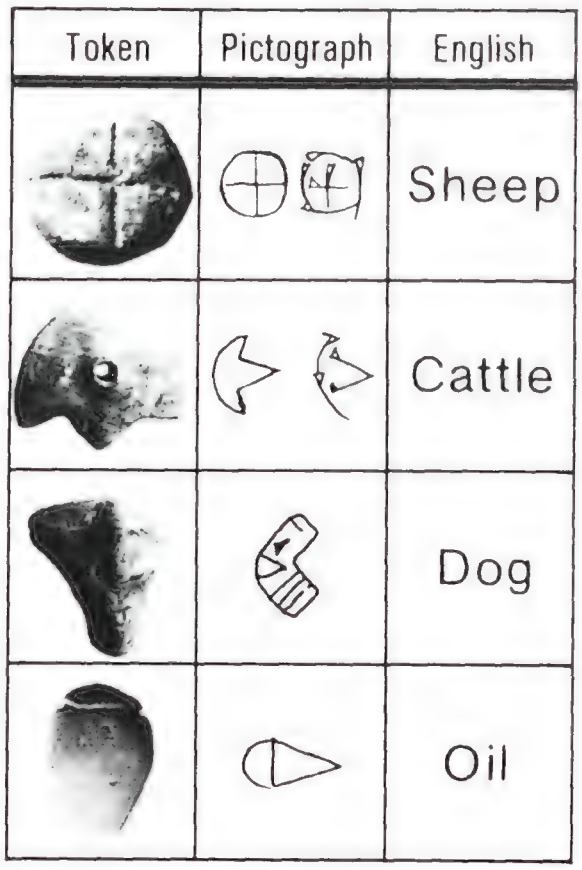
An argument can be made that this puts to use a lot of otherwise useless pets that spend all day or night turning wire wheels in their cages like . . . so many . . . turbines. . . . See? The possibilities go on and on and on. . . .

*Reading, writing and arithmetic . . .*

Writing, and its concomitant, reading, are generally thought to be a major step along the erratic path to civilization and the common wisdom suggests that somehow, for some farsighted reason or in response to some sudden need, a bunch of wise old folks in Sumer sat down and systematically determined that a few pictographs would henceforth mean certain desired concepts. With their little wedge-shaped styli, they thus began the revolution shortly to be eclipsed by electronics.

Not so fast, says Denise Schmandt-Besserat in *Archaeology* (Vol. 32, No. 3). Currently an assistant professor at the University of Texas at Austin, she has spent a considerable time pondering the small ceramic tokens that have been found in Middle Eastern sites dating as far back as 10,000 years ago. Generally accepted as gaming pieces, they are small and come in a variety of shapes—spheres, discs, cones and so forth—but there seemed on reflection to be an awful lot of them. Life may have been easier then, agriculture having just been "invented," but not easy enough to have permitted *that* much leisure. Made of fired clay, they are the earliest fired ceramic objects in the Middle East, suggesting a function. They had become common—even "omnipresent"—some 5,500 years ago, by which time they also showed more variety.

Professor Schmandt-Besserat proposes that they were counters, used to record quantities of commodities—grain, oil and so on. Later, strung together, they could have represented orders—30 sheep and 10 cows, please—in the increasing trade with distant cultures, even getting around lan-




Ceramic tokens, left column, may have been "pictures" of commodities traded.

# The Other Hawaii.

## "Here is a tropical paradise that is barely discovered. And, yes, it is in Hawaii."

James A. Michener

### Maui

Here on unspoiled Maui is a paradise much like the place I had in mind when I wrote of Bali Hai.

### Molokai

Along the Pali Coast, waterfalls plunge hundreds of feet directly into the sea.

### Hilo and Kona

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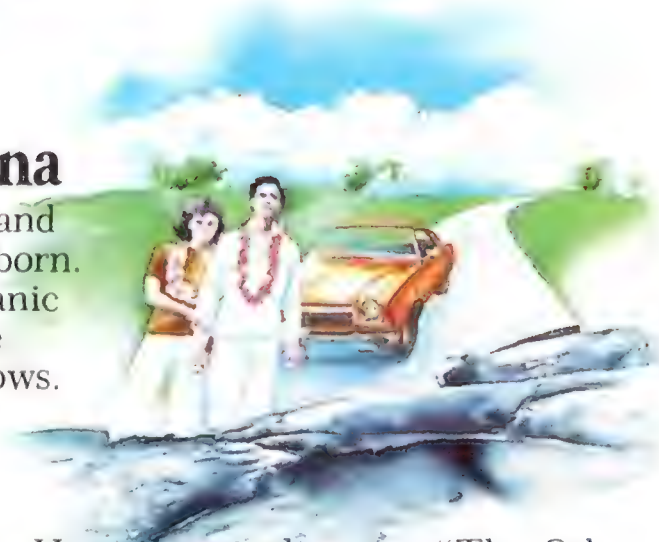

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guage problems so long as all hands recognized a disc with a cross etched on it, say, as meaning a sheep.

The Middle Easterners began carrying the tokens in little closed pots, marked with the owner's seal and inscribed with pictograms of the tokens inside. It was only later that the Sumerians began to dispense with the tokens and the pots altogether, using clay tablets. But their "writing" wasn't the great breakthrough into abstract symbols representing objects or ideas that it is thought to have been. The pictograms represented tokens, which in turn represented, but looked nothing like, certain real objects. The Sumerian achievement was to render more efficient a system of abstract symbols that had been in use for millennia. Like all "breakthroughs," it was a step down a long evolutionary path.

### *. . . And other civilized habits*

Not long after the ancients got all that counting and writing business straightened out, they proceeded to establish another pattern that appears to be a hallmark of civilized societies: they created cities on earthquake faults. Recently Amos Nur of Stanford told the American Geophysical Union that while Joshua may have "fit" the battle of Jericho, it was an earthquake that made the walls come tumblin' down, and also dammed the River Jordan with a mudslide, letting Joshua and the troops get across. This same fault, the Dead Sea Rift, is a landward continuation of the boundary between the African and Arabic plates and, reports *Science News* (Vol. 115, No. 23), it destroyed Qumran and, perhaps appropriately, Sodom and Gomorrah.

Nur hints in this connection that the Old Testament prophet Zechariah may be the first geologist worthy of the name. He writes in his Book (14:4), "the mount of Olives shall cleave in the midst thereof toward the east and toward the west, and there shall be a very great valley; and half of the mountain shall remove toward the north, and half of it toward the south." Could St. Andreas have said it better?

### *The ego trip of birdsong*

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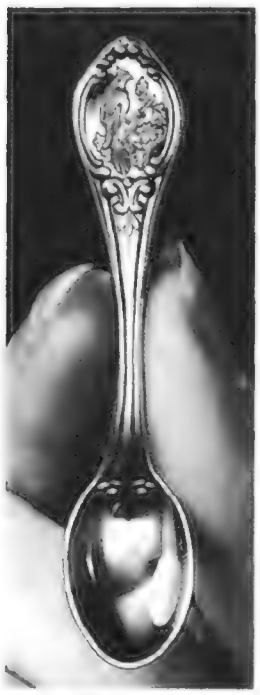

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Ruffed Grouse Pennsylvania
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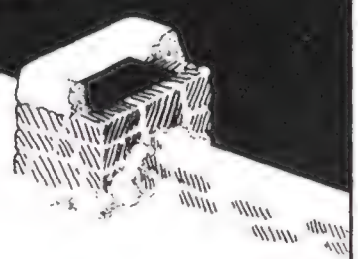

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wren may have a repertoire of more than 100 discernible songs—apparently the greater the repertoire the more attracted females will be. The repertoires of canaries grow with age, and the greater the repertoire the more stimulated are the females to make nests and lay eggs: quicker attraction presumably means more offspring, which makes for greater survival value, as do experienced fathers. All of these various "reasons" for birdsongs are explored in *New Scientist* (Vol. 82, No. 1157) by Dr. Jeremy Cherfas, who says that underlying the variety of uses of birdsong is just the one simple message: I am here.

OK, but what then are we to think of the mockingbird? One hot summer night I heard a mockingbird outside my house do a perfect imitation of the last couple of bars of a Louis Armstrong riff I had just listened to on the hi-fi. Minutes later it was a cat or catbird. Then, I think, a distant siren. Just who is the mockingbird saying is here?

### *The ultimate Raid*

Organic chemistry, as anyone who went to college knows, is one course which weeds out the no-hopers from the future doctors among the premed students. Its complex flow charts of chemicals and arrows leading to other chemicals reminded a physical chemist of "a lot of cockroaches chasing one another with spears," according to a report in *Chemical and Engineering News* (Vol. 57, No. 18), and the simile has now proved apt.

After 30 years of trying, says *C&EN*, the efforts of four research groups, working in nice organic synchrony, have provided hope that control is nigh for one of mankind's peskiest and most tenacious colleagues on the planet—the cockroach. The female chemical which gives the mating itch to the male American cockroach has been isolated from the female and synthesized. It is called periplanone B and now the research enters phase two, seeking ways to use it against unsuspecting males. Once the chemists have whomped up enough of the stuff—which will no doubt take years—we may expect TV ads filled with zillions of little cartooned roaches all chasing around after some chimerical Marilyn Monroach until they expire of exhaustion. It will be one commercial you can believe.

—James K. Page jr.


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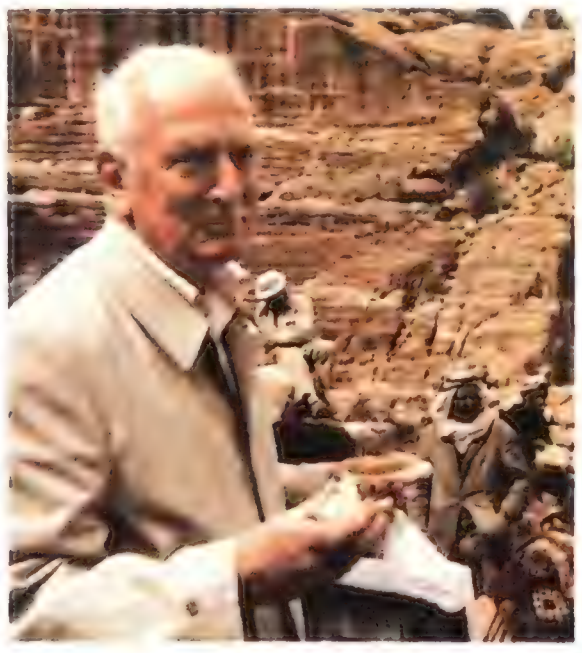
# *Around the Mall and beyond*

The seemingly cultured and urbane gentleman who appears on this page is, in fact, a cultured and urbane gentleman. He is Richard H. Howland, who has the title of Special Assistant to the Secretary here at the Smithsonian. And, beyond that, he is famous for his orchestration of the Institution's foreign study tours.

Last April, Dick Howland led his last tour. He is giving up this particular showcase for his talents. Because it was his valedictory, it was a very special trip. First, it was to Greece and the Greek islands—an area that Howland rightly considers his own backyard of expertise. Second, Lady Bird Johnson, former First Lady, signed on. So did her daughters, Lynda Bird Robb and Luci Nugent. So did her friends Laurance and Mary Rockefeller. So did her former aide, Liz



"Sir Richard" Howland, tour leader

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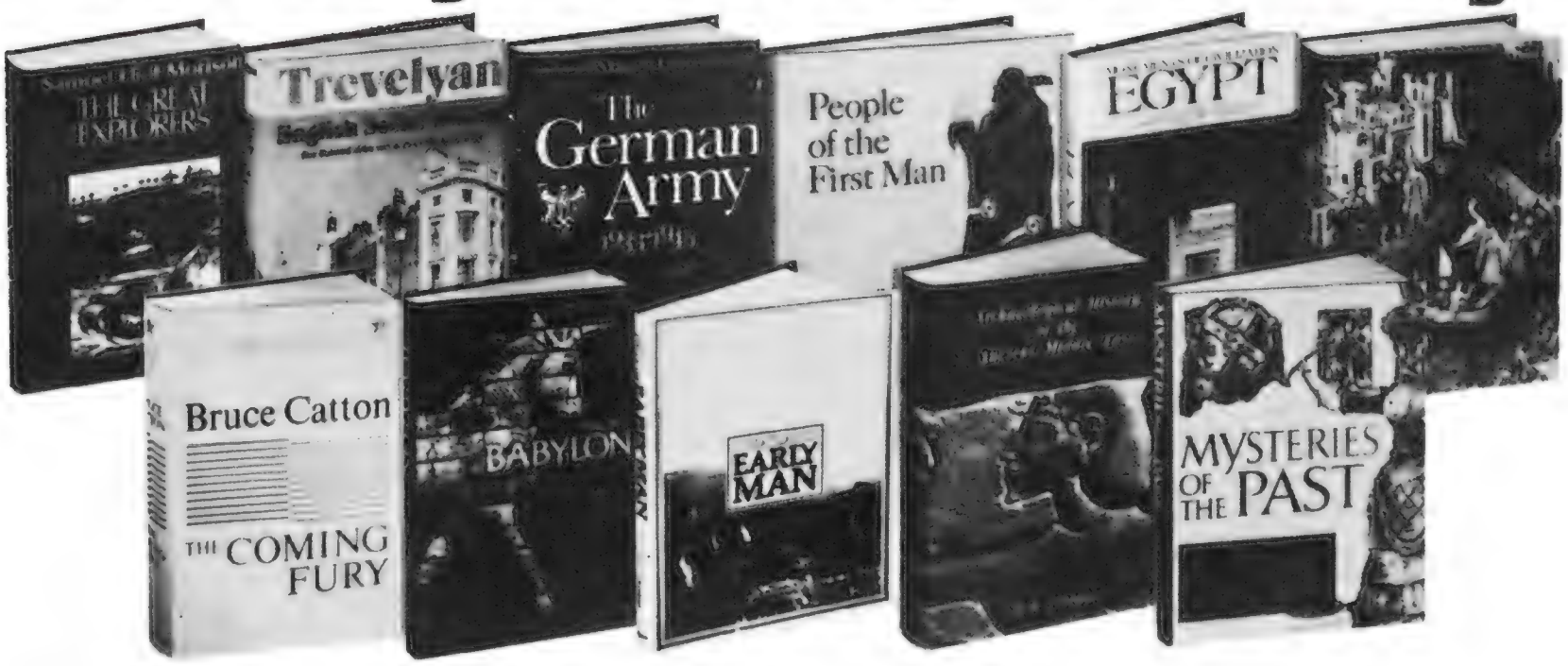


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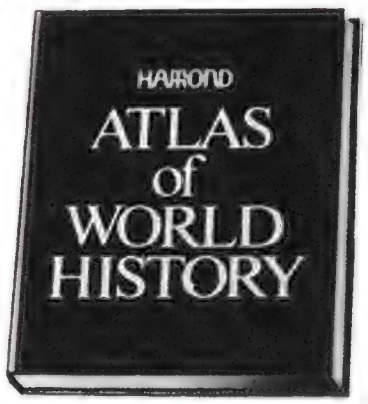


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Carpenter, now a heated proponent of ERA. So did a decorator friend, Bob Waldron, and so, too, did assorted Texans and author Allen Drury and some Secret Service men and Erma Bombeck and Senator Talmadge's former wife.

They all added up to a pretty chic group—more than a hundred of them—held together by the indomitable tour administrator, Bliss Schumann. Lecturers included an archaeologist, Dr. Jerome Sperling; a medievalist, John Slocum; and a botanist, John Bevan jr.

Above and beyond all loomed Dick Howland, treating everyone with the kindly tolerance of a Dean of Freshmen and leading them through their odyssey with the calm assurance of the late Arthur Fiedler conducting the Boston Pops. Dick has been shepherding seekers after knowledge around Europe for a decade, seeing to it that his charges return in two or three weeks, pampered in body, and enriched in mind. Having a former First Lady along didn't faze him a bit.

"We made one change, but not just for Mrs. Johnson," he told me. "We were scheduled to stop at Kusadasi, in Turkey, on our fifth day. From there, you know, it's only a step to Ephesus with all those marvelous excavations. Well, we got word of a planned demonstration there. Anti-American. Mrs. Johnson offered to stay aboard the cruise ship—most thoughtful—but it was simply too risky for the group. So we canceled out and went to the island of Chios instead. You know it, of course. Grand mosaics in the monastery."

I did not know it, of course, but I guess I nodded, anyway.

"Having the Secret Service men along was quite . . . different," Howland continued. "They were fine chaps. They all looked strangely alike. And they did a little exhibition for us one evening. A karate demonstration. Extraordinary!"

And so it went. I had heard enough about Dick Howland's tour technique to picture his final appearance. He is a classical scholar—classical archaeology and architectural history are his special fields—and has impressive credentials: Brown University, a Harvard Master's, a Johns Hopkins PhD and finally a Brown honorary. He was a Norton Fellow at the American School of Classical Studies in Athens, taught at Wellesley, set up a Department of Art History at Johns Hopkins, served as President of the National Trust for Historic Preservation and came

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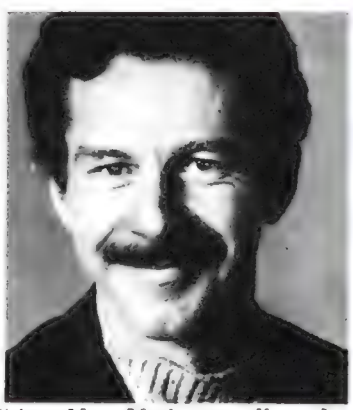

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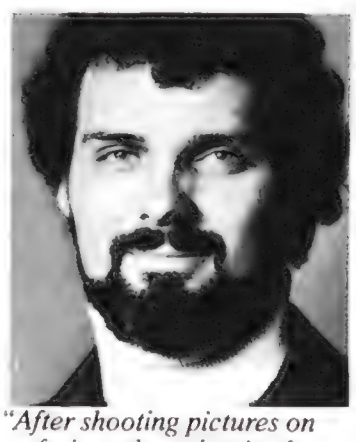

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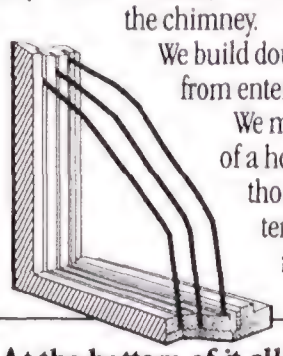

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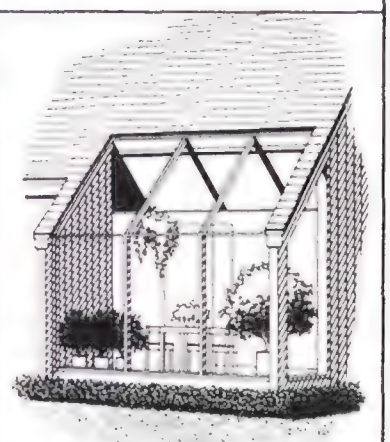

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to the Smithsonian in 1960. When he speaks Greek, the Greeks listen to him. When he recites in classical Greek, the shade of Sophocles should join in. When he describes Greek drama on the ancient stage at Epidaurus, he acts all the parts, leaping from protagonist to chorus and back again to make it unforgettable.

He did that last on this valedictory trip, holding his audience of VIPs spellbound. I got the word from one of them, Mrs. Dorothy Marks, who kept a sort of log of the trip, especially those events that referred to the Johnson party. For example: "It is Easter Sunday. . . . At luncheon, I encounter my first octopus in wine and garlic sauce. . . . It is too overcast to see the Doric columns of the Temple of Poseidon as we sail past Cape Sounion, but Dr. Howland tells us about them on the ship's loudspeaker system. Anyway, everyone is busy trying to get a picture of Lady Bird Johnson in her life jacket."

Let me quote a little more to transmit the tone of this tour: at Mycenae, "Lynda Robb and Dick Howland spar over whether Queen Clytemnestra was justified in killing Agamemnon. After all, as Lynda argues, he had killed her first husband, carried her off against her will and sacrificed their daughter to the gods. . . . We explore first the digs of the ancient Bronze Age town of Akrotiri. . . . Mrs. Johnson, a pedometer strapped to her waist, is leading our group. Luci is our most avid notetaker . . . and has begun pressing wildflowers in a large folio. . . . All the Secret Service men have bought themselves worry beads and flick them expertly, just like the natives. . . ."

At the farewell dinner, Liz Carpenter, "Mistress of Revels," produced the biggest set of worry beads she could find—huge, square, wooden ones—and everyone signed his name and gave them to "our ultimate leader, Sir Richard."

Howland admits he will miss the pleasant esteem of the tour groups, but he will now have time for other interests—old houses, Baltimore history, Victorian furniture and still plenty of travel on his own, for his own purposes. My association with him has pushed me up the social ladder, I think. In the old days, I used to get routine invitations to Smithsonian openings, unpretentious cardboards, printed rather austerely, informing me that So-and-So Exhibit would open on a certain date at Such-and-Such Museum.

Contact with Sir Richard made a differ-

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Scene of fantasia, Victorian style.

ence. I suddenly had entrée to the Victorian Horticultural Weekend in June, which was put on by our Office of Horticulture, the Society of American Florists, the Victorian Society of America and the Smithsonian Resident Associates. It amounted to a deep Smithsonian bow to the flowers of spring, which are presented to us at the Institution by Jim Buckler, our Director of Horticulture. The main event of the festival was a dinner ball in the Victorian Garden: a striped marquee, black tie or period dress, spotless napery, gleaming old-fashioned silver services, hanging baskets of flora, lights glowing on the lawn, a tinkling fountain. . . . You get the picture? There may have been Victorian flavor to the music early in the evening, but by the time we showed up the band had gone mad for Dixieland, intermixed with the Glenn Miller sound and one burst of disco which we oldsters sat out unless we had reached such euphoria that we didn't care anymore.

The other dab at high society began with the arrival of a very thick cardboard inviting me to the Vice President's house. That's of the United States, I mean. It turned out that Mrs. Mondale was honoring a few Western artists and showing them some of the artwork in the mansion (SMITHSONIAN, September 1977).

I was, of course, asked by mistake. I knew this, way down deep, and the guard at the gate confirmed it. "You're not on the list," he said, sorrowfully, when I flashed my thick card at the barrier. Then, giving way to better feelings, he hefted the card, agreed that it seemed OK and raised the bar.

The property is a beautiful, broad, tree-shaded hilltop that it shares with the Naval Observatory. At the doorway of the nice old turreted house stood Mrs. Mondale, cordial and lovely and knowledgeable about our magazine. Mr. Mondale was there, too, for awhile, and he was tanned and healthy-looking, the way politicians always are. Ever notice that? I saw Senator Edward Kennedy not long ago, and he looked tanned and healthy. I often feel it would be reassuring to see a politician looking fish-belly white with purple bags under his eyes.

I saw the new art and wandered out to another marquee where there were things to eat and drink and a combo from the U.S. Army Band playing light selections. And out on that wide lawn there was a pair of robins, and a blue jay called from a tree. You can only see a couple of buildings through the trees.

I found all this out because I stabbed a strawberry with a toothpick, dipped it in confectioner's sugar, popped it in my mouth—and inhaled the sugar. So I had to step out for a good cough. I haven't been asked back—partly because I choked on the sugar and mostly because I wasn't really invited in the first place. So I guess that's the thickest card I'll ever get.

—EDWARDS PARK

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# executive health

the report that briefs you on what to watch


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New research findings . . .

## ON WALKING . . . nature's own amazing *"anti-age antibiotic"!*

Not running, not jogging, but *walking*
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Today, after some 2000 years, modern medical researchers are demonstrating (somewhat to their surprise) that Hippocrates, "the father of medicine" was right . . . walking is man's best *"medicine"!*

Take one example. At a three-day conference on *Exercise in Aging—Its Role in Prevention of Physical Decline* (held October 27-29, 1977, at the National Institute of Health, Bethesda, Maryland) researchers from across the United States, Canada and Western Europe presented papers on this (until now) largely neglected area of research. As their papers were presented, these important points of agreement emerged:

(1) Walking is the most *efficient* form of exercise . . . and the only one you can safely follow all the years of your life.

(2) Exercise can enable your body to maintain a *vital reserve* which has a protective effect during stress.

(3) Exercised *bones* do not demineralize. As a result they are far less likely to break or lose their range of motion.

(4) Exercised *lungs* still exhibit the emphysema-like changes of age, but are far less diminished in their capacity compared to the lungs of sedentary people.

(5) Exercised *cardiovascular systems* show a similar maximum preservation of function.

(6) The benefits of exercise in preventing or correcting obesity are striking.

(7) Late-onset diabetes is almost entirely reversible by exercise if you are overweight.

(8) Daily exercise permits greater food intake and better blood circulation, thus improving each body cell's nourishment while preventing obesity.

(9) The physically impaired, particularly the arthritic, can perhaps benefit the most from exercise . . .


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*By Dora Jane Hamblin*

# Experiment in Tunisia effects pause in spread of Sahara's expanding sands

*A pilot project, part of a world study,*
*restores desert and analyzes data*
*which may make such areas livable*

If the Creator ever decides to ask for the world back, he will certainly find that the property "needs work," as real estate advertisements put it. He may even find that it desperately requires "creative couple who enjoy renovating"—a worst-case situation.

Some global creative couples do exist. One is the combination of Utah State University ecologists and the Tunisian Ministry of Agriculture, their efforts coordinated by a remarkable Tunisian resident of Russian extraction and French citizenship named Georges Novikoff. They have spent seven years working on a renovation plan for a very dilapidated piece of world property, the Sahara desert fringe in North Africa.

The Tunisian PreSaharan Project, as their research effort is known, occupies only a small plot of this desert fringe, but it has greatly expanded our understanding of a desert ecosystem. An ecosystem is a complex of communities living within a distinctive type of terrain and vegetation and specific climatic conditions: in this case a population ranging from ants and vipers to sheep, goats, camels and humans, set in a sere, rolling landscape of encroaching sand dunes where temperatures can soar to 110 F at midday and mean annual rainfall is roughly four inches, a little more than twice as much as falls in Death Valley. The predominant vegetation is a scrubby plant called *Rhanterium suaveolens* which does not grow in the United States but which struggles against the odds in Tunisia to support grazing animals and hold back the dunes.

The research done here looks as unimposing as the arid land. There is none of the drama of irrigation projects and reclamation schemes that transforms desert into garden, as in Israel. Here instead are fenced fields, less than 350 acres in all, with small plots of scrawny barley, flocks of sheep and goats, a tiny white "field house" without water or electricity. But wind gauges turn, precipitation measuring pails stand on sturdy posts, a shiny device on which the local shrikes like to perch measures radiation from the blazing sun, and cement troughs catch blowing sands for measurement. Earnest scientists make complicated soil analyses. They thrust thermometers into ants' nests to measure differences in temperature at ground level and below. They stealthily pursue snails, beetles, snakes and lizards over and under the sparse vegetation, and chart the habits and numbers of birds that prey on them. They dig up indigenous plant specimens to measure root systems, and fence off "exclosures" in which to measure vegetation growth in undisturbed

Behind the project's fenceline, reclaimed land supports grazing of sheep and goats, while in the foreground rippled desert is spreading.

*Photographs by Ralph Crane*

Scientists, technicians and herdsmen make up staff, led by Georges Novikoff (dark glasses).

Sheep wearing collection bag is contributing data on energy flow.

areas. They follow grazing animals about with stopwatches, making "bite counts" to learn how much animals eat and what plants they prefer, and they hang canvas bags on the beasts so they can analyze feces to determine how much of the food energy is used, how much excreted.

In gathering all this mass of detail, compiling heaps and piles of charts and statistics, the researchers have two aims: total comprehension of the ecosystem and the development of techniques which will enable human beings to wrest a living from these marginal lands without destroying them.

Deserts and marginal lands have been studied before, but the Tunisian project is the first primarily ecological study to include a detailed, meticulous look at the human beings who live within the ecosystem. Resident coordinator Novikoff advocated this unique approach because, as he says, "Deserts don't just encroach through some inscrutable will of their own. Encroachment is caused by the very force which is the ultimate victim—Man."

People have helped cause the spread of deserts by abusing the land in many ways—by overgrazing stock, by shortsighted farming methods, by yanking up shrubs to build huts and animal pens. Yet human beings must live, so two intensive projects in "human bioenergetics" and "effects of rural-urban migration" were set up to study 24 families—some 150 out of the 3,733 individuals who live in the lightly populated 375-square-mile area surrounding the ecosystem's acres. Everything was measured, from family size to amount of property, from hours spent in fuel gathering to those devoted to sowing, harvesting, herding and domestic chores. Annual income and expenditure were determined and broken down into source and category. Food consumption was tabulated and its "use" in the form of expended energy calculated. Chief researcher on this project was William H. Bedoian, who has worked as a doctoral candidate in Tunisia and at Penn State since 1973. Much work on energy expenditure and nutrition was done by his wife Kathryn, who had the advantage of being able to speak to the women, as did Concepción E. Lee, a graduate student at the University of Wisconsin, whose research traced the shift to a more socially differentiated, consumer-oriented society. Tunisian women in this part of the country do not speak to males outside their immediate family and are not photographed.

Little more than a generation ago, families such as these were nomads wandering across vast reaches of

*The author, a free-lance writer who lives in Italy, reported the multinational excavation of the ruins of Carthage in* SMITHSONIAN, *February 1979.*

Food intake of all creatures in the ecosystem, even spiders, is measured.

In a dash across catchment basin, sheep and goats vie for place at trough. Water comes from cistern (left).

Africa with their flocks, temporarily using the land and then moving on—which gave it a rest. But bureaucratic pressure (governments don't like nomads wandering willy-nilly across borders, untaxed and unregistered) and the amenities of a more sedentary life, such as schools, mosques and markets, have persuaded most of the former nomads to settle in permanent or semipermanent homes. Settlement promotes land degradation, because the herdsmen graze their flocks near where they live, year after year, and vegetation never has a chance to recover. Another consequence of a more sedentary life has been an increased birthrate, which puts further pressure on the land and drives farmers into less and less desirable territory. The Tunisian population growth rate is now 2.6 percent a year, surpassing even that of India and more than three times that of the United States.

Families living within the ecosystem, researchers found, are able to eke out a subsistence living only if there is a male member who can find work outside—in a nearby city, or abroad—and send money home. And their desperate efforts at home to coax subsistence from their acres create more desert. In all Tunisia thousands of acres a year are rendered infertile by wind and rain erosion—in a nation the size of Louisiana. And between one-third and one-half of the whole "*Rhanterium* zone," the grazing territory epitomized by the project's landscape, has been rendered useless in the past 50 years.

The problem, of course, is not restricted to Africa: 14 percent of the world's population, more than 600 million, live in dry lands dependent on a marginally productive environment. Worldwide, about 14 million acres of arable land disappear each year as deserts spread and populations grow. Even in the immensely fertile United States, roughly 15 percent of the land is designated "arid," requiring careful treatment lest its fragile fertility be destroyed forever.

To confront this spreading peril, the Desert Biome Project of the U.S. International Biological Program was launched in 1968 at Utah State University at a meeting of interested scientific investigators from a number of Western universities. The US/IBP has been a voluntary, nongovernmental organization sponsored and financed by the National Science Foundation. With headquarters in Logan, Utah, the Desert Biome has been directed by Dr. Frederick H. Wagner, who also conceived and directs the Tunisian project.

In the United States investigators applied themselves to study of the Great Basin Desert, the Mohave, the Sonoran and the Chihuahuan. Then they fanned out to other arid regions—Tunisia, Egypt, India—in hope of setting up similar studies for comparison and correlation. Tunisian authorities liked the idea, the

Researchers measure roots of *Rhanterium*, a vigorous plant which penetrates hardpan to survive dry years.

Smithsonian Institution offered financial backing, and Novikoff was chosen scientific coordinator at the site.

Work began in 1972 at a 123-acre plot called Dar ez Zaoui just a few miles inland from the humid coastal plain of the Mediterranean in southeastern Tunisia where it touches Libya. It was chosen partly because its latitude, mean annual temperature and precipitation are similar to that of a Mohave desert site not far from Las Vegas, Nevada, where US/IBP scientists had already accumulated a lot of data.

This made sense, but there was also an irony to the choice. For here in the encroaching desert, where several thousand people can now barely survive on a few hundred square miles of land, are the remains of great cities and granaries. Under the sands lie the relics of millennia of human occupation by Romans, Byzantines and Arabs, among others. In Médenine, the town nearest the project, are the remains of fortified *ghorfas*, odd peaked honeycomb cell houses made of clay and rubble but often six stories high. Less than a century ago there were still 6,000 of them, in which Berber farmer-herdsmen stored fodder, surpluses of grain and provisions against marauders. Roman mosaics in the area depict animal hunts in forests that flourished 2,000 years ago, and less than 100 miles north stands an amphitheater which received a steady source of lions from its surrounding territory in the days when much of present Tunisia served as a major part of Rome's principal breadbasket.

When the Dar ez Zaoui site was selected and fenced, it housed on its meager acres two active sand dunes with no vegetation whatever, 80 percent of their surface covered with the ripple marks that indicate moving sands. Two slightly smaller areas within the research area had not yet been invaded by dunes but showed 40-60 percent ripple marks. Another area showed surface crusting, and a final one, rather small, had both mixed soil and vegetation. This dreary property was leased from its owners, who moved themselves and their flocks to another site nearby, and work began. Tunisian technicians set up the first rudimentary measuring devices and the first wave of scientists moved in, many of them young doctoral candidates from the United States and Australia, some postdoctoral scholars intrigued both by the project and the opportunity to work in exotic Tunisia.

They equipped a four-laboratory office ("with lots of ice" Novikoff recalls) in the nearest "big town," Gabès, population 28,000, set up delicate instruments with which to measure the weights of ants and beetles, the respiration rates of all insects and animals within the ecosystem and the chemical content of soils.

"It seems orderly now, but in the beginning it was chaos," admits Novikoff. "We didn't know anything *scientifically*, we only knew from observation and intuition. Almost immediately we divided the total problem into specific areas of study and then found scientists to come and study them. It requires a certain kind of dedication, a special kind of person."

Special people turned up. Dr. Robert J. Muir of the University of New England in Armidale, New South Wales, Australia, moved to primitive quarters near the site with his wife and an infant. He spoke neither Arabic nor French, but he and his family stuck it out for four seasons, studying the nutrition of invertebrates, oxygen consumption of insects, microclimates and the temporal activity patterns of animals. They also learned French and a little Arabic.

There was John Skujins from Latvia, with a PhD

Foraging desert ants are counted as part of study of their range, food they collect, numbers in nests.

Cajoling landlords who want to raise the ecosystem's rent, Novikoff explains grant funds are limited.

from the University of California and now at Utah State, who examined the soil microbiology and biochemistry. And there were Utah State graduate students D. Coleman Crocker-Bedford and Kara-Lynn Crocker-Bedford who, despite the sound of their names, were born in Seattle and St. Paul, respectively, and who spent months making detailed livestock studies on flock size, composition, breeding rate, growth and dietary preferences, patiently comparing methods and results of the project's controlled experimental flocks with those of the neighboring farmers.

Gradually chaos turned into order and the pattern of the ecosystem began to emerge—in those heaps of data it would eventually require a computer to comprehend. Biome researchers were soon learning how tampering with one part of the ecosystem—ants, for example—could throw some other part, or the whole thing, out of whack. Muir and Dr. Harold Heatwole, Professor of Zoology at the University of New England, studied hundreds of ant colonies, measuring populations and forage range (one column of foragers 66 yards long was spotted on an April day in 1978), and even the amount and nature of their food. The latter was done by gathering up the chaff neatly distributed in concentric circles outside nest entrances, then separating, identifying, weighing and tabulating it. Ants are among the world's most prodigious workers and many are seed eaters. Some can transport 18 times their own weight in food. In a high-rainfall year plants even in marginal zones produce more seeds than ants can eat. But in a dry year their tireless legions will scoop up every seed in sight, leaving very little to germinate and to produce the next year's crop.

It might be possible to exterminate the ants, but this could create a new problem: one of their favorite foods is the seed of a noxious weed, which might take over the territory if the ants didn't carry away the seeds. If this weed came to dominate the *Rhanterium suaveolens* and the annual *Plantago albicans*, which is a favorite sheep food, the animals would suffer.

Some beetles tend to control ant populations by eating them; others dine with equal pleasure upon succulent growing green things, as in fact do snails. The total impact of this minuscule munching has been measured at the project and declared a "substantial" contribution to the loss of vegetation.

As if all this weren't complicated enough, there is the grazing effect. Unrestricted grazing, a common practice in the *Rhanterium* zone, tends to drive away foraging ants. Whether ants are disturbed by the trampling flocks themselves, or whether the grazers eat vegetation before full seed production can occur, thus starving out the ants, has not yet been fully determined by the researchers.

Sheep and goats, particularly in mixed flocks as they are normally maintained here, crop short any bit of vegetation and their trampling so loosens the sandy soil that a whisper of wind will blow it first into ripples and eventually into dunes. The goat, which has long been cast as the chief villain in the desertification of many regions, including the Middle East, may not be any more destructive than the sheep. While the sheep graze plants close to the ground, the goat browses with its head held higher, eating shrubs and

taller vegetation. Excessive numbers of either animal grazing continuously in one area will damage the vegetation severely. Together, they can wreak havoc on the entire plant spectrum.

Both species will eat dried-up detritus. The litter-eater is in this respect as destructive as the plant-destroyer, because litter is a protective layer which inhibits wind erosion. On the experimental plots researchers have determined that one centimeter of litter will hold ten centimeters of loose sand and prevent it from blowing away. The lowly goat has one big advantage: it is the most valuable of arid land beasts, able to survive when sheep and cattle perish, thus providing a last-ditch supply of milk, meat and skins to an endangered family.

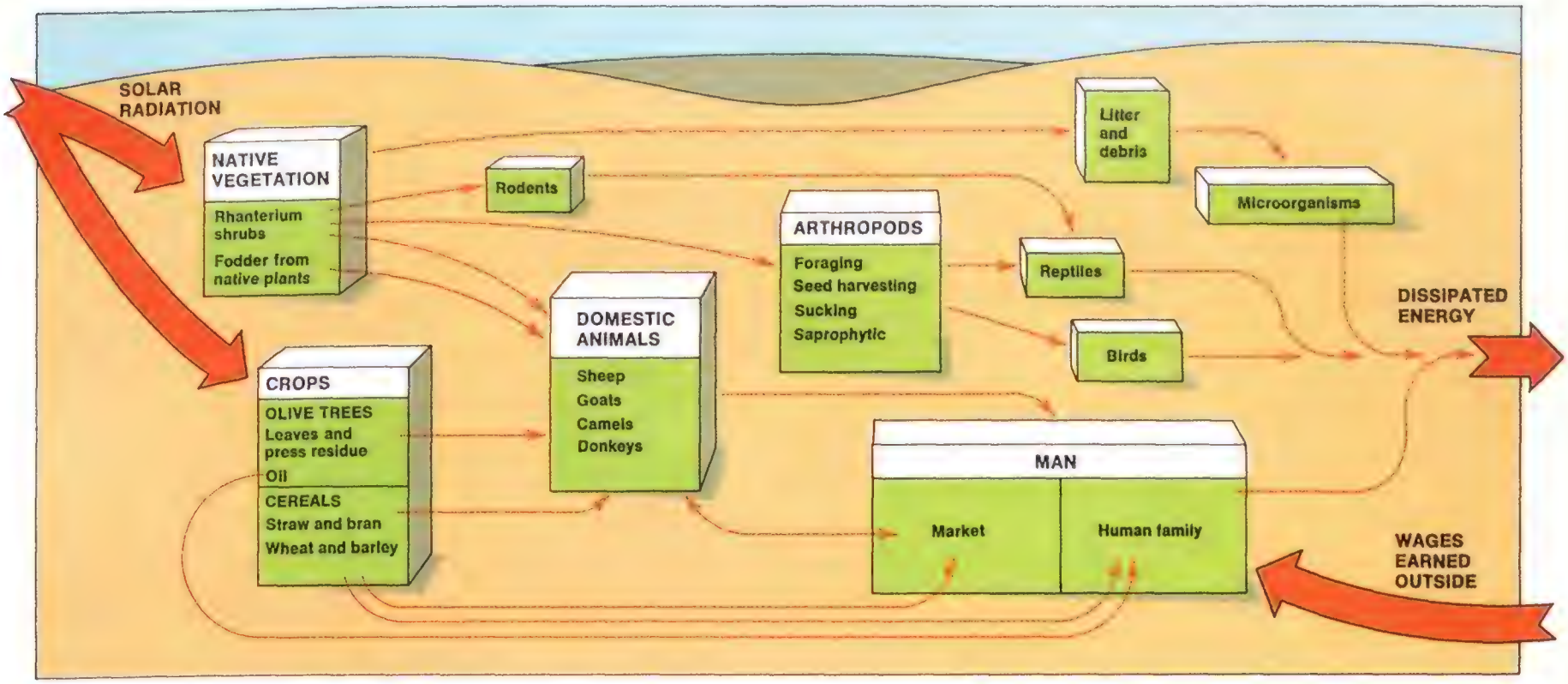
Having noted their somewhat dissimilar eating habits, the researchers have experimented with mixed flocks and flocks of sheep or goats alone. The results suggest that good range management would be to graze them on the same plots but in different cycles, a plan which would give each species' least-favored vegetation a chance to flourish.

Controlling, restricting and rotating grazing involves slightly more work for the herdsmen but, demonstrably, it accomplishes the purpose of revegetation and turning back desert encroachment. On the project's fenced plots the flocks graze according to strict plan: only in winter, only in summer, only in autumn or, for temporary periods, not at all. Native plant growth has responded in spectacular fashion. Within two years with this treatment, the sand dunes inside the fences were stabilized and some vegetation had come back; within three years there were no more ripples anywhere.

Some water is now available by pipeline in this area of the *Rhanterium* zone, but it is restricted to the vital watering of animals during the arid months and is not available for irrigation. Rainfall thus remains the crucial source for forage and grain crops and the major control on the functioning of the ecosystem. But even rain itself, the boon of dry lands, can be a mixed blessing. In the growing year 1975-76 five times the normal amount of rain fell and forage crops grew rampant. But the leaves of two varieties developed a withering rust from the abundant moisture, and *Hedysarum spinosissimum*, which normally accounts for half the annual forage production, first formed thick mats several yards square, then dried out. The leaves and fruits which usually cure on the stalk and provide food for sheep and goats for a prolonged period, instead shattered and fell to the ground.

Rainfall has a complex relationship to a host of other processes as well. It determines, for example, how many men will migrate to cash-earning jobs, mostly manual, in nearby towns or nations. If autumn rains are skimpy, heralding a bad crop and inferior

Denizens of ecosystem include Athena's little owl, partly diurnal; nonvenomous desert brown snake, edging out vipers in control area; a heap of beetles seeking respite from noonday sun in hole




Energy from solar radiation flows through the *Rhanterium suaveolens* ecosystem in this simplified chart, reflecting the type of data fed to computers in attempt to model and predict ecosystem behavior.

Solar energy flow diminishes when rain is scarce, is enhanced when it is adequate. In poor crop years, men leave for cities or abroad, reducing labor force but bringing their wages into ecosystem from outside.

grazing, the men leave. If rains are adequate they stay on the land to help. Good rains, well distributed, also greatly alter a family's plans for range management. Most tend to increase the size of their flocks to take advantage of the expected vegetation, and more importantly they make plans to sow grain crops, wheat and barley, on as many of their acres as they can put into cultivation.

These decisions again make waves throughout the ecosystem. The increase in flock numbers tends to cancel out the increase in vegetation, and the amount of grazing land is diminished when parts of it are turned to grain cultivation. Then there is the harvesting effect. Wheat is normally harvested with a sickle and the stubble left in the soil, but barley is yanked up, roots and all, by hand. This abrupt disturbance loosens the soil even more than does grazing and trampling, and exposes the land to instant wind erosion when the harvest ends.

Changing cultivation patterns compound the complexities. A study by William Bedoian showed that the traditional plow, a single-bladed instrument usually drawn by a camel, is being replaced by tractors pulling polydisk plows which can work 12 times as fast as a

in sand; *Messor* ant hauling *Plantago* fruit head many times its size and weight; lidless gecko, a night lizard which washes eye by sticking out tongue and licking; shrike, nemesis of resident lizards, beetles.

man with a draft animal. The temptations of quick gain induce most families to invest large amounts of their hard-earned cash to hire the tractors. Also, plowing by camel is slow going, and the planting season very short. If plowing is not done within about 15 days after the first good autumn rains, there may not be enough soil moisture to support sprouting and the initial establishment of seedlings. Over the long run, however, the polydisk disturbs much more of the soil than does the traditional plow, and encourages it to blow away, while at the same time it packs down the soil below the surface. After a few years of polydisk plowing the lighter sandy soil has blown away and the packed and striated underlayer has become as hard and impenetrable as cement.

One result of all these studies has been a clear demonstration that controlled grazing, proper harvesting and retention of litter can stop desertification and even begin to reverse it. With new devices developed in the United States, such as the "sweep" plow which aerates the soil but does not disturb its surface, and drill planters which can seed plots right through stubble and litter, it may be possible to further improve both crops and conservation.

The ultimate aim of the Biome Research Project is development of a computer model of entire desert ecosystems, a simulation which can be manipulated in theory to determine the effects of changes in land use, flock management, insect control, amounts of rainfall, and so on. Because the mass and complexity of the data are too great for human mind and manual data processing, the field research and results have been organized in such a way that large computers can analyze the material. Similar studies are being conducted in Iran by Dr. Brian Spooner of the University of Pennsylvania, in Kenya by Dr. Hugh Lamprey under support of the U.N. Environment Program, and in Egypt by Egyptian scientists with support from the U.S. Environmental Protection Agency.

On the basis of data gathered over a period of years, the computer can be fed fairly accurate information as to what happens when it is dry, when it is wet, when flocks graze freely or are controlled, the optimum number of beasts per grazing acre under varying conditions, and the amount of livestock, olives, grain or cash needed to sustain an average family. It can even be fed, upon the basis of present and accumulating data, certain predictive information. "It looks like a dry year," or "sheep and goat populations are rising rapidly." Then it can be asked, "What's going to happen as a result?"

If the data prove to be correct, the computer—once it is properly programmed—can "manipulate" the entire ecosystem in a matter of seconds and tell range managers and stockmen exactly what they should do to achieve the greatest possible gain with the least damage to the ecosystem itself.

But semiliterate farmers on a subsistence level have developed theories and practices of their own, rooted in long tradition. Few are interested in the concept of long-term goals. If this year they need the barley roots for their animals, they will pull them up no matter what any expert tells them. Their goal is simple and short-term: to stay alive.

Novikoff and other researchers see this as a difficulty: providing practical knowledge to the native population. "We already know enough about range management and subsistence economy to turn back the desert and help the people in better herd practices," says Novikoff. "The real problem is acceptance. We must convince them to accept different ways, different techniques."

There is striking evidence that the much-abused sandy soil of this area has a resilience far higher than similar arid lands in other parts of the world. Dr. Wagner describes as "one of the most remarkable findings" the fact that both flora and fauna recovered within a mere three-year period of control, and that the soil was completely stabilized.

The Tunisian government agrees that all this is desirable but has not found funds to carry on the project when the researchers leave. Unless support comes from other sources, or the Tunisian government finds men and money to disseminate the solid knowledge which has come from this meticulous research, then the whole brave effort will be obliterated like the Roman cities under the sands.

Shrike impaled this lizard on barbed wire for easy feeding, then devoured all but bony head.

*By Patrick Young*

# Biomedically, NIH does more, better, than anyplace else

*With understanding of the cell as its focus, the National Institutes of Health paces the world in basic, applied, clinical research*

The cell is a tiny, wondrous world with a complexity as great as any in the universe. The human body contains about 100 trillion of them, most with a diameter less than one-third of a human hair. Within each lie factories to manufacture proteins, power plants to generate energy, intricate transportation systems for molecules and networks for communication.

Our lives begin with the fertilization of a single cell, and disease and death are essentially the nonfunctioning or malfunctioning of cells. "We are sick because our cells are sick," Nobel laureate Christian de Duve of the Rockefeller University has said. "We cannot make ourselves well unless we know what is happening inside our cells."

There are seemingly endless questions about the cell and its structure—how it works, how it communicates, the substances it makes and the ones it takes in, how and why some cells divide and others do not, how specific cells know whether to become bone, skin, connective tissue, nerves or a part of various organs. Understanding them holds the key to preventing, treating or curing innumerable diseases.

Therefore the cell, in its many manifestations, is a fundamental concern of the National Institutes of Health (NIH), a part of the U.S. Department of Health, Education, and Welfare, and one of the premier biomedical-research organizations in the world.

Following World War II, Congress made a profound decision—to continue the strong federal financial support of scientific research initiated during the war. It

Working directly with cells, with animals and with the ultimate beneficiaries—human patients—scientists at the National Institutes of Health push back the frontiers of biomedical knowledge in 1,500 separate

*Photographs by David Attie*

laboratories. Information gained from cells (in electron micrographs at upper right) is first tested on mice, rats, rabbits. Later it may help patients admitted to the NIH hospital (diagnostic machines are used at top and below, right center). This incredible array of people and high technology uses less than 12 percent of the NIH budget; the rest mainly supports research at American medical schools.

*In biomedicine, NIH leads the league*

was a particularly important decision for the life sciences. Congress changed the name of the National Institute of Health, created in 1930, to the National Institutes of Health, expanded its role and charged it with improving the health of all Americans. Its basic tool was money for research, both by its own scientists and by those at universities, colleges, medical schools and research laboratories across the land. In the past three decades, there have been few biomedical advances in which the NIH has not played some role.

NIH scientists, or its grantees working elsewhere in the United States or abroad, developed the first artificial heart valve, the first heart-lung machine for the first successful open-heart surgery, and a cure for choriocarcinoma, a rare but once-fatal cancer which arises from the placenta. They found that an inadequate absorption of vitamin B-12 caused pernicious anemia and that slow and latent viruses caused certain degenerative brain disorders. They discovered the enzymes vital to the biosynthesis and metabolism of the chemicals that form the genetic materials deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

Sixty-nine researchers supported by the NIH have won Nobel Prizes, including four of its own scientists —Marshall W. Nirenberg (1968), Julius Axelrod (1970), Christian B. Anfinsen (1972) and D. Carleton Gajdusek (1976).

The roots of what is now the NIH go back to the Laboratory of Hygiene, established at the Marine Hospital on Staten Island, New York, in 1887. From a one-scientist laboratory dedicated to research on cholera and other infectious diseases, an organization has evolved that today consists of 11 research institutes, four research divisions, the 561-bed Clinical Center, the National Library of Medicine and the John E. Fogarty International Center for Advanced Study in the Health Sciences.

The NIH is headquartered on 306 rolling acres in Bethesda, Maryland, a Washington suburb. Most of its more than 12,000 full-time employees work there on what is commonly and appropriately called "the campus." But several units are located outside Bethesda, including the National Institute of Environmental Health Sciences at Research Triangle Park, North Carolina. (The National Institute of Mental Health, a part of the NIH until 1967, still conducts most of its intramural research program on the NIH campus, particularly in the Clinical Center.)

In hundreds of NIH laboratories, scientists seek to understand the cell, its functions and malfunctions and their relationship to human disease and disability. Visits to three projects provide some insights into the people of the NIH and the diversity, rewards and frustrations of basic, applied and clinical research.

In a fourth-floor laboratory at the National Institute on Aging's Gerontology Research Center in Baltimore, Dr. Gaither Bynum hovers over two gray mice and sews together their peritoneums, the membrane lining the abdominal cavity. When he finishes, the two anesthetized animals—one young and one old—lie joined like Siamese twins.

"When we sew them together, side by side, the blood vessels mix and blood goes from one animal to another," explains Dr. Edward L. Schneider, chief of the center's Section on Cellular Aging and Genetics. "So if there is any factor relating to aging in the blood, we can detect it. If there is a circulating factor in the old animal causing a reduction in cell proliferation, then we may see the reduction in the younger animal too."

Throughout recorded history, Man has longed for immortality and dreamed of youth eternal. Yet the serious study of the universal phenomenon of aging, the investigation of the mechanisms by which cells change and we grow old, is fairly recent (SMITHSONIAN, October 1976). Schneider became a convert to the search in 1970. He was four years out of medical school and pursuing research in human genetics at the University of California Medical Center in San Francisco.

"In medical training, I was appalled at the treatment given older patients," he recalls. "When I went to a conference on aging, I was impressed by a field that was very new and very exciting, a place where a person could work and make real contributions."

Schneider's excitement was not widely shared at the time. Aging held a relatively low priority in research; the NIH's effort languished in the National Institute of Child Health and Human Development. Yet the

*For seven years the science-medical writer at the* National Observer, *Young now free-lances in Washington. His latest book is about cats.*

Dr. Edward L. Schneider (center), carefully weighs out a chemical sample for use in the examination of cell replication and repair of DNA damage. At top, Dr. Gaither Bynum prepares to inject a mouse for genetic studies. While Dr. Schneider's laboratory at the new National Institute on Aging centers on cellular activity, other laboratories are involved in the study of the entire person (middle left and upper right).

*In biomedicine, NIH leads the league*

Surrounded by the paraphernalia of his work, Dr. Roscoe O. Brady (at center in laboratory and below with a model whose liver and spleen are marked), looks for better way to replace the missing enzymes

NIH has always encouraged new, innovative research projects and traditionally given young scientists major responsibilities and opportunities. Schneider gambled and joined the NIH early in 1973, even though Congress had rejected a proposal to establish a National Institute on Aging within the agency. It was a gamble that paid dividends; a year later Congress approved the new institute and Schneider became part of it.

Most, but not all cells within the body proliferate by dividing. We are born with and keep until we die all the nerve cells we will ever have (soon after birth they never divide again), but red blood cells live only about 100 days. Every minute some three billion body cells die; the same number is created each minute through cell division.

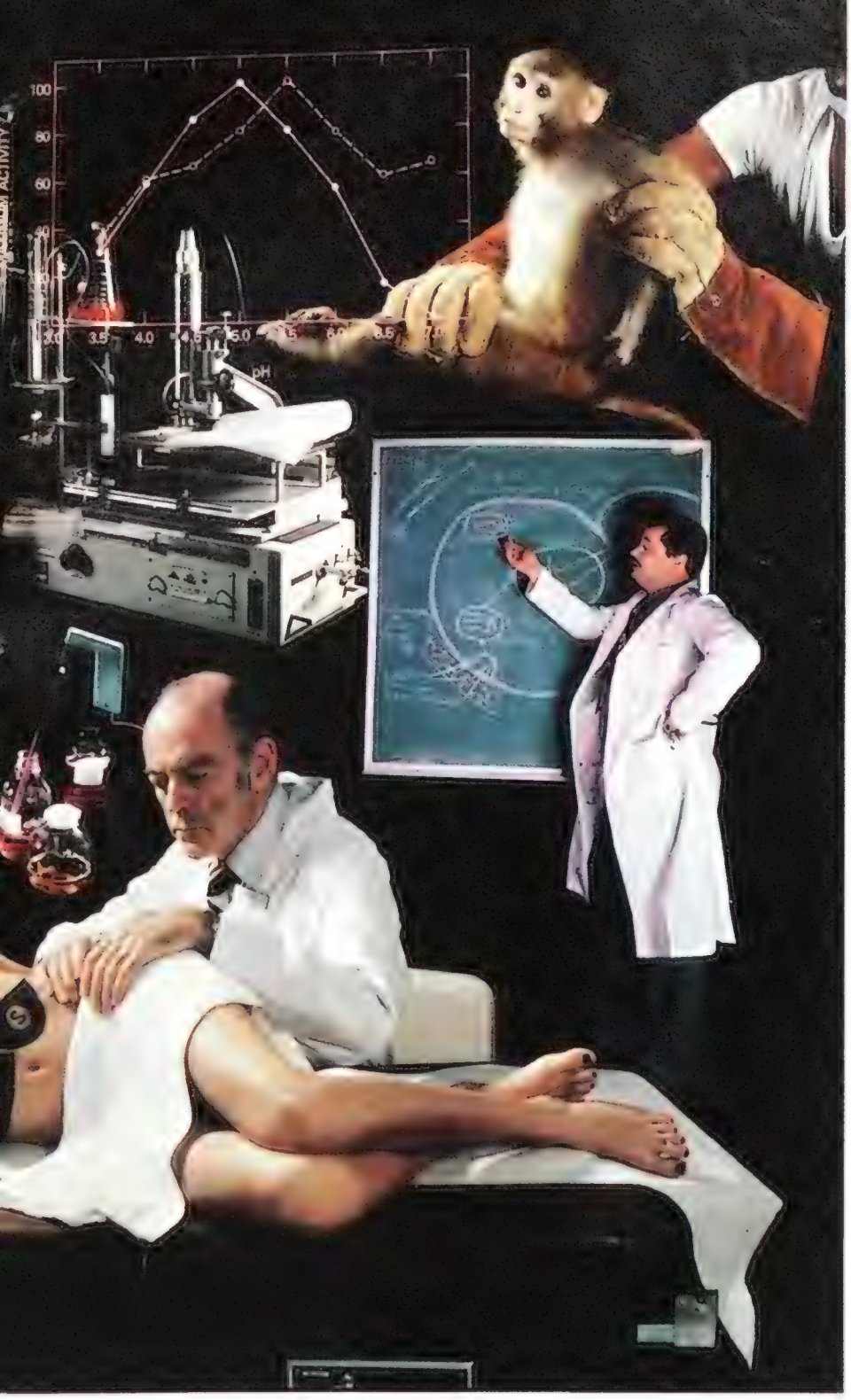
A decline in the ability of cells to replicate has been associated with aging. Older people are more susceptible to infections and cancers, suggesting a diminished functioning of the immune system, which relies on the proliferation of white cells. Wound healing, which requires that old cells divide to provide new cells, also slows with age.

When he joined the NIH six years ago, Schneider set out to determine whether cell replication does, indeed, decline with age; if it does, learn why; if the mechanisms are discovered, find ways to reverse them. Only recently has he felt justified in beginning work on the second of these priorities.

As early as 1961, Dr. Leonard Hayflick, now at Children's Hospital in Oakland, had grown fetal cells in the laboratory and concluded that human cells had a finite capacity to replicate. Schneider, in collaboration with Dr. Youji Mitsui, who is with an aging-research laboratory in Tokyo, extended this observation to cells from young and old adults. They found that cell cultures derived from older volunteers had considerably shorter "in vitro" life-spans than those from younger ones and that cell replication also appeared to be significantly altered in older cell cultures.

While working with tissue cultures, Schneider was also searching for a better means of studying cell replication in living animals. The traditional method used radioisotopes, which themselves inhibit cell proliferation. The search was long but finally he, Dr. Raymond R. Tice and John Chaillet, then a premed student at Johns Hopkins, found an answer.

The drug bromodeoxyurdine is almost identical in its chemical structure to thymidine, one of the four building blocks of DNA. Cells will take up the drug and incorporate it instead of thymidine into the DNA of new cells produced by division. With fluorescence techniques, cells containing bromodeoxyurdine can be



in patients suffering from lipid-storage diseases. The enzymes, once isolated by intricate laboratory processes (upper left and center), are tested first on experimental animals, then on humans.

distinguished from those that have mostly thymidine.

Schneider and his colleagues first used this technique to examine the replication rate of white blood cells taken from young and old volunteers. They found that in older individuals fewer white cells replicate, and those that do divide at a slower rate. "This helps to answer the question of whether the immune response declines with aging," Schneider says. "Our evidence suggests that while cells may not stop proliferating with aging, they apparently slow down."

Now Schneider is beginning the search for the cause or causes of reduced cell proliferation. There are many possibilities—some alteration of the DNA structure perhaps, or a change in a cell's ability to repair DNA damage.

"I don't think aging is due to any one single cause," Schneider says. "We are at the very beginning, trying to establish how aged cells differ from young cells. We are at the stage in the field of aging research where cancer researchers were ten to 20 years ago."

For nearly a quarter-century, Dr. Roscoe O. Brady has dreamed of devising cures for certain inherited and often fatal diseases. That doctors now foresee a day when babies born with these disorders—called lipid-storage diseases—can be treated is due, importantly, to Brady. That such infants cannot be saved right now is a profound disappointment to him.

The concept for treating these types of diseases is simple enough. The ailments result because cells are unable to make an enzyme needed to break up lipids —fatty substances in cells—at the proper time. As a result, fatty materials accumulate inside the cells and damage or destroy them. The idea is to give a patient the missing enzyme, which is different in each disease, so the cells can use it to function properly. But as Brady and others have found, enzyme-replacement therapy is very difficult.

The most common lipid-storage disorder is Gaucher's disease, in which the liver and spleen become enlarged and bones deteriorate. It may range in severity from being virtually unnoticed in some to fatal in early childhood in others. A better-known but less frequent condition is Tay-Sachs disease, in which fatty materials build up in the nerve cells of the brain, causing a slow death. Tay-Sachs children appear normal for the first five or six months of life; then they begin to show progressive mental retardation and loss of muscle control, hearing and sight. Death almost always occurs before age four. Other disorders include Niemann-Pick disease, often fatal before age six, and Fabry's disease, which is found primarily in males and generally causes death by kidney failure in adulthood. (With the exception of Fabry's disease, these disorders are especially prevalent in persons of Ashkenazic Jewish ancestry—almost exclusively so in Tay-Sachs.)

When Brady, who is now chief of the Developmental and Metabolic Neurology Branch of the National Institute of Neurological and Communicative Disorders and Stroke, began his lipid-storage research in 1956, no one knew what caused these diseases. It took him nine years of painstaking work to prove that missing enzymes did. He and his research team did so by discovering what enzyme was missing in Gaucher's disease. A year later, they identified the enzyme lacking in Niemann-Pick patients and the following year found the enzyme missing in Fabry's disease. Subsequently, enzyme deficiencies have been proved to cause all ten of the known lipid-storage diseases.

Knowing what enzyme is missing, researchers can

devise tests to determine which healthy people carry the defective gene that fails to code for the enzyme. Such "carriers" can then be counseled about their risk of producing a child afflicted with the disease. Tests based on amniocentesis have also been developed to tell whether a baby will be born with one of the diseases. Brady's group produced the prenatal tests for Gaucher's, Fabry's and Niemann-Pick diseases. Antenatal tests are also now available for Tay-Sachs and the other lipid-storage disorders.

The ultimate goal, however, is to find a cure for them. And that has proved far more elusive. Brady has conducted enzyme-replacement experiments in a dozen patients, and knows from these tests that the recipients tolerate the injection of the missing enzymes satisfactorily without producing antibodies against the replacement ones. (If they did, developing treatments for the diseases would be vastly more difficult.)

He also knows his treatment concept is probably valid. "We've shown in the laboratory that if you can get enough enzyme into the cells, it can clean out all of the accumulated material," he says.

In 1974, Brady injected two Gaucher's patients with glucocerebrosidase, the enzyme their cells lacked. In each case one-fourth of the fatty material accumulated was removed.

An experiment with a Tay-Sachs patient was less successful. In this disease, the damage occurs in the brain and the enzyme required to treat it can't get past the blood-brain barrier, a protective group of tightly joined cells that prevents all but the smallest molecules from entering the brain. Recently Brady, along with Dr. John A. Barranger of his team and Dr. Stanley I. Rapoport of the National Institute on Aging, found a solution. Using a technique developed by Rapoport to open temporarily the blood-brain barrier, they have succeeded in getting enzymes into the brains of test animals, where they enter the nerve cells.

A critical decision now is whether to try this approach in humans. "It's hazardous," Brady acknowledges, "but a Tay-Sachs patient will surely die, so you have to consider the risk-benefit."

The overriding question confronting Brady today is: "Can we realistically put these enzymes back into people to cure their disease? We're trying to do that, but it's tricky. We are just emerging from the beginning and we like what we are seeing."

Brady has spent 25 years at the NIH. His work is known worldwide; many medical schools would be delighted if he joined their faculties. But Brady prefers life at the NIH to more lucrative opportunities elsewhere, and his reasons are a measure of the place.

"My superiors are very supportive of my work," he says. "There is a freedom here for investigation that is hard to duplicate. There is also a concentration of scientific competence. A lot of work a scientist does involves collaborating with others. You often have ideas relating to your own problem that require expert help. Here, you simply walk down the hall and if somebody likes your idea, they will work with you. NIH is not the only place this happens, but it is a major reason I've stayed."

Thirty test tubes form an orderly rectangle in their laboratory rack, an inch of red liquid pooled in the bottom of each. Suspended in that liquid are ovarian-cancer cells drawn only hours before from a 48-year-old woman at the Clinical Center, a huge 14-story structure with some six miles of corridor that houses NIH's research hospital and nearly 800 laboratories.

"She is, unfortunately, at the stage where a lot of ovarian-cancer patients end up," says Dr. Robert F. Ozols, a research physician in the National Cancer Institute's Medicine Branch. "In the past, we had nothing to offer such patients except to treat their symptoms and make them as comfortable as possible."

Like all NIH patients, she is treated free. To be accepted at the Clinical Center, patients must have a disease NIH researchers are investigating and be referred by their physicians.

The woman's cancer has become resistant to the standard and experimental drug treatments usually used in ovarian cancer. But Ozols and Dr. Robert C. Young, chief of the Medicine Branch, Division of Cancer Treatment, hope that a promising but highly experimental technique may yet reveal a way to help her.

Mixed with the patient's cancer cells are various concentrations of two anticancer drugs. In a few minutes, the cells will be removed from the drugs and grown for three weeks in tissue culture. Then the researchers will look to see if either drug, in any of its concentrations, proved active against the cancer. If so,

Dr. Robert C. Young (center), chief of the Medicine Branch at the National Cancer Institute, and Dr. Robert F. Ozols (left) work directly with patients. They take ovarian-cancer cells from a patient, culture them and then test drugs against them. Drugs that fight the cancer cells in the laboratory are then given to the same patient. Experimental drugs are used only after conventional treatment has failed.

the woman may be treated either by injecting the drug or temporarily filling her abdominal cavity with a solution of the drug to directly bathe the malignancy. There is nothing else now that the doctors can offer such a patient.

So far, however, the NIH physicians have proceeded with caution. They use drugs of known effectiveness to treat patients initially, holding the drugs identified in the lab for use later, if conventional therapy fails.

The early work looks promising; hopes are high that better means of treating ovarian-cancer patients will be found. But months, perhaps years, of testing remain.

In the past three decades, cancer chemotherapy—the treatment of malignancies with drugs—has made major advances. Nearly 50 antitumor agents are in use today, culled from thousands after extensive testing. Yet chemotherapy's success is spotty. Some cancers respond well to drugs, but many do not. Some cancers respond to many drugs; some to only one or two. The same holds for each patient's response to drug therapy.

A decade ago, Young was part of the NIH team that developed a drug treatment for Hodgkin's disease, a lymph cancer, that has saved thousands of lives. Now he directs his own team.

"There is a tremendous excitement when one first makes an observation that is unknown to anyone else," Young says, explaining what lured and keeps him in research. "Cancer is a major killer and many changes are going on in the treatment of cancer patients; many are alive today who would have died ten years ago."

*In biomedicine, NIH leads the league*

The tiny, intricate cell—like the vast, complex universe of which it is part—yields the secrets of its basic workings reluctantly. One of the factors that determines success in modern science is money—how much is spent, who gets to spend it and what it is used for. Need for money, one means to the end of unlocking the cell's secrets, generates jealousies, rivalries, conflicts and philosophical disagreements as great in biomedical science as anywhere.

Throughout much of the NIH's two postwar decades, Congress lavished funds on the agency, sometimes appropriating more than even its administrators requested. The NIH's power and worldwide recognition grew with its budgets and with the successes scored by researchers receiving agency support. Its power and prestige remain great, but changing times, inflation and shrinking job opportunities in research have left their unpleasant imprint.

The failure so far of the much-publicized effort to conquer cancer, or to even make major strides against the disease feared most by Americans, has cost the NIH credibility with the public, some scientists contend. "The 'war-on-cancer' fiasco has hurt all the biomedical sciences," says a leading heart researcher.

NIH will spend $2,661,971,000 of its $3.2 billion fiscal 1979 budget on research, and more than 88 percent of that will go as grants and contracts to outside researchers. Each research proposal is reviewed by a committee of experts in the project's field, a process called peer review. These men and women, all scientists from outside the NIH, rate proposals for such things as scientific merit, feasibility and the competence of the applicant and research staff involved. Approved projects are then given a priority score. The higher a proposal's score, the greater its chances of winning funds.

"The advantage of peer review is the ability to judge ideas with the maximum of competence," says Dr. Donald S. Fredrickson, NIH's director since 1975 and an internationally known authority on lipid metabolism. "You get the best possible technical judgment of a request for public funds."

Yet one hears complaints that the peer-review system is little more than an "old-boy" network that favors friends and the famous over young, innovative researchers. "The young guys with bright ideas get very discouraged," concedes one NIH administrator.

Frederickson acknowledges mistakes are made within peer review. "It is not 100 percent accurate, but it is better than using government employees, astrology or prayer to make judgments," he says. "We do know that, each year, ten percent of the winners in the competition for grants are people who have never been in the system before."

Within the NIH, Frederickson must deal with the demands of other government agencies who want instant answers to complex scientific questions, as well as staff morale and employment practices. Some young NIH scientists complain that personnel policies protect and favor older, mediocre researchers.

Despite such problems, the long tradition of excellence and productivity of NIH's laboratories continues. NIH scientists receive less than 12 percent of the agency's total research funds; yet the Institute for Scientific Information in Philadelphia found that of the 300 scientific papers published between 1961 and 1976 most cited by other scientists, no fewer than 45 were written by scientists who were affiliated with the NIH at the time. The institution with the second highest score was Harvard, with 19.

Little escapes the NIH net. Unmentioned so far are the National Heart, Lung, and Blood Institute; the National Eye Institute; and the National Institutes of Allergy and Infectious Diseases; Arthritis, Metabolism, and Digestive Diseases; Dental Research; and General Medical Sciences.

"This is an institution totally dedicated to research, where one is not distracted by the duties and obligations of a university or medical school," Frederickson says. "In a most poetic sense, it is a place where the search for reality goes on, where we seek to understand the universe of biology and find the knowledge most needed for today's and tomorrow's world."

NIH's 11 research institutes provide the wherewithal (for example, top to bottom, cell cultures, computer model of an enzyme, lasers and the *nude* mouse so useful in genetic studies) for the next generation of biomedical science. The goal of all basic, applied and clinical research is the same: better human health.

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# OF NORMAN ROCKWELL

exquisite finishing touch, two bands of precious 22 kt. gold will be hand-applied to each bell.

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Russian Museum, Leningrad

You may be sure that this exotic, pensive creature was quite accustomed to the silks, furs and feathers with which she is surrounded in Briullov's 1841 study of the *Princess Elizaveta Pavlovna Saltykova*.

*By S. Frederick Starr*

# The little-known Russian art of an Imperial era

*Soviets release to this country a unique showing of Czarist art in the style of 1800-50, which is now at the Smithsonian's Renwick Gallery*

Tretyakov Gallery, Moscow

In the canon of academic portraiture is Vasilii Andreevich Tropinin's *Boy with a Zhaleyka* (flute).

Entering one of the high-ceilinged exhibition rooms of the Renwick Gallery, just across Pennsylvania Avenue from the White House, the visitor is confronted by a six-and-a-half-foot-high portrait of a lady no less elegant and opulent than the 19th-century gallery itself. Clothed in silk, a peacock-feather whisk in her beringed hand, a leopard-skin rug underfoot, she seems a kind of fairy-tale princess (opposite). In life she was Elizaveta Saltykova, a true princess, and she was posing at her family's mansion in St. Petersburg, now Leningrad. The year was 1841.

Any painter in Europe might have envied Karl Briullov's luck in getting the commission for this portrait. The princess' family, the Stroganovs, were immensely wealthy and had patronized a major school of religious painters, not to mention some excellent chefs. Her father had commanded Russian troops in the liberation of Paris from Napoleon in 1815, and her grandfather had directed the Imperial Academy of Arts so effectively that his memory was still revered when Briullov was a student there.

Better than any other painter in Russia, Briullov could flatter his subject, and his subject's wardrobe, home, pets and children, if necessary. He charged a lot for this, which enabled him to live well, which in turn gave him entrée to the most fashionable homes—thereby justifying his high fees.

As Briullov's sumptuous portrait attests, Russian painting came of age in the first half of the 19th century. Between the years just prior to the Napoleonic Wars, in which Tolstoy's *War and Peace* was set, and the late 1850s, when Turgenev began writing his finest novels, Russia's secular painters attained levels of skill comparable to all but the very best West European masters. Yet their achievement has until now been little known or appreciated outside Russia. Western critics have been so taken with Russian avant-gardists of the early 20th century—Kandinsky, Malevich, Chagall—that they have ignored this earlier Golden Age of Russian painting. This neglect was long reinforced by the Russians themselves. Committed to the politically engaged doctrine of Socialist Realism in art, Soviet culture barons were far more interested in showing their Western friends politically upbeat works than the less polemical masterpieces of the age of Briullov.

The Renwick exhibition, on view through November 12, has changed all this. Organized by the University of Minnesota Gallery, this collection of some 140

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paintings and decorative objects has already astonished audiences in Minneapolis, Chicago, East Lansing and Madison, Wisconsin.

No such exhibition could have been assembled from American collections, or even from West European museums, both of which are weak in pre-20th-century Russian art. Barbara Shissler, the organizer of the exhibit, had become infatuated with 19th-century art while organizing an exhibition of Victorian British paintings for the University of Minnesota's gallery, which she then directed. In November 1974 she accompanied her physicist husband on a trip to Moscow and was greatly impressed by the Russian contemporaries of Ingres, Delacroix and Turner.

She resolved to introduce these little-known Russian painters to the American public. But representative works by the painters whom she had "discovered" in the Tretyakov Gallery in Moscow and the Russian Museum in Leningrad were simply not available in the West. Her next step was logical but unprecedented for an American university gallery, or even for a local museum: she went directly to the Ministry of Culture of the Soviet Union. She asked the ministry to lend works by some of Russia's most prized painters to a group of Midwestern American universities. To her surprise, and delight, the Soviets consented.

A year of negotiations followed. Who would insure the paintings? Would a Soviet curator be on hand when they were unpacked? Would delicate watercolors be sent as well as oils? These and countless other technicalities were resolved, one by one.

Alla Butrova visited Minneapolis and Washington for the Ministry of Culture and became so enthusiastic over the project that she and Barbara Shissler were soon working together to expand its scope. Concerts of Russian music of the period were planned and the Guthrie Theater agreed to mount a performance of Gogol's *Marriage* under the direction of Anatolii Efros, from the Malaia Bronnaia Theater in Moscow, and with set design and costumes by Valerii Levintal, permanent designer with the Bolshoi. The exhibition finally opened in Minneapolis on October 7, 1978.

Visiting the exhibition, one quickly discovers a number of painters whose styles and characteristic subject matters set them apart. Besides the sumptuous portraits by Briullov, there are Byronic and introspective portraits and self-portraits by Orest Kiprensky, voluptuous pieces by Fedor Bruni, sun-drenched Italian landscapes by Silvestr Shchedrin and the deeply Russian genre paintings by Aleksei Venetsianov (p. 59). If there was a Russian school of the period, it was led by artists of very diverse talents. Yet Kiprensky, Briullov, Shchedrin, Bruni and Venetsianov were all the products of a single national environment and one that before 1800 had produced only a few individual artists of note. What, then, was happening in Russia

Palatial setting is shown in Konstantin Ukhtomsky's 1851 watercolor of a St. Petersburg drawing room.

Hermitage, Leningrad

Grigorii Soroka, a serf bound to the estate, painted idyllic vistas in

during the period 1800-50 that brought so many painters to the fore?

It has often been said that good politics do not necessarily make good art, while great art can flourish under adverse political and social conditions. For few settings is this dictum more appropriate than for Russia in the reign of Nicholas I (1825-55). Known to his numerous critics as "Nicholas the Stick," this stern disciplinarian began his reign by suppressing a liberal rebellion at home, maintained the largest army in Europe, marched troops into both Poland and Hungary to put down reform movements in those countries and generally espoused the cause of autocracy and Russian nationalism as a holy crusade. As many as 90 percent of Nicholas' subjects were serfs, bound either to the estates of the gentry or to the state directly.

The institution of serfdom lurks like a shadow behind most of the paintings on exhibition. A single cousin of Elizaveta Saltykova owned more than 35 million acres—roughly the area of the state of Iowa—and 80,000 serfs. Briullov's fee came from the labor of such peasants. Grigorii Soroka, whose naive but hauntingly sensitive *Chapel in the Park of Ostrovki* is one of the gems of the exhibition, was himself a serf, and did most of his paintings at the estate to which he was bound and on which he served as a gardener. Industrialization had already begun in Russia, but emancipation did not come until 1861.

Russian serfdom was a far milder institution than American slavery in that it interfered less with the serf's family and community. Soroka's canvases of his master's estate may not be typical of the attitude of serfs, but it is hard to conceive of a slave producing as idyllic a picture of an American plantation. Nonetheless, the world created by serfdom bears certain resemblances to the antebellum American South. Both limited the audience for high culture to a small elite. Serfs and slaves were out of the picture, and there was no large middle class to subsidize the arts. As a result, the culture makers—painters, musicians and other artists—were beholden to the few serf owners and officials who could afford to be patrons. That most artists came from modest backgrounds only reinforced their dependence on these few.

To be sure, Russian artists knew that painters in Paris were embroiled in revolutionary activity. But most rejected the idea of being an avant-garde in either a political or esthetic sense, and were only too glad to find a niche for themselves within the system. When satirical painting came into fashion in the 1840s, it was of a sort that even the Czar's ministers could enjoy.

Russia's serf society discouraged artistic independence, but it did not lead to provincialism. In fact, Russian painters lived in a surprisingly cosmopolitan world. Like the American South, which produced numerous persons who were as much at home in Paris

poetic moods at lord's domain; this is Moldino Lake on Ostrovki estate.

Russian Museum, Leningrad

Soroka here focuses on the chapel in the Ostrovki park, which can also be seen in painting at left.

Tretyakov Gallery, Moscow

Russian Museum, Leningrad

Street scene, *A Groom Buying a Ring for His Bride,* by Aleksander Ivanov, was painted about 1838.

or London as in New Orleans or Charleston, Czarist Russia prided itself on being open to the world beyond its borders. Indeed, most of the painters represented in the exhibition had studied and worked in Italy, then the Mecca for painters of all countries. There they fell into the cosmopolitan community of artists and writers which included, at one time or another, such luminaries as the Frenchman François Marius Granet and the Englishman J. M. W. Turner, not to mention such Americans as Washington Allston and Horatio Greenough. A thriving community of Russian aristocrats welcomed artists of all nations in Naples, Rome and elsewhere. Near Florence they could visit the art patron Count Anatolii Demidov's private collection, among the finest galleries in Europe in the mid-19th century. When these painters returned to St. Petersburg or Moscow (and not all of them did), they brought back the latest ideas from what was then the artistic capital of Europe.

Silvestr Shchedrin was typical of Russia's Italianized artists. Before his death in 1830, he painted scores of landscapes of Naples and Sorrento. Shchedrin's Italianate style became immensely popular with collectors from England and France, as well as Russia. His letters are filled with complaints of the pressure that so many commissions imposed on him.

What was the style that captivated the many foreign artists who flocked to Italy? Joshua Taylor, Director of the National Collection of Fine Arts, defined it in a paper delivered at the symposium organized for this exhibition. According to Taylor, those working in Italy discovered the secret of depicting nature as it was, rather than as a projection of human intellect. A key to this development was the new technique of making light radiate from deep within the painting itself, rather than from the world outside. The Russians quickly mastered this concept.

The impact of Russia's one-sided cultural exchange with Italy went beyond such technical issues. Before the 19th century, nearly all Russian artists had been icon painters. The goal of their craft was to create images through which the individual Christian could worship God. Those few painters not engaged in this demanding but tradition-bound enterprise were busy doing documentary portraits or monumental projects after classical models. They ignored less "elevated" subjects such as landscape and the trivia of everyday Russian life. But the encounter with the seductive Italian countryside and its peasantry broke down this prejudice. As Italy's artists took their easels out-of-doors, the Russians followed. Once acquired in Naples or Tuscany, the habit of painting nature and scenes from daily life spread to Tula and Smolensk.

The process by which Russians assimilated their native environment under the impact of Italian art is epitomized by Aleksei Venetsianov. Rare among Russian painters, he did not actually study in Italy. But by the 1820s one did not have to have done so in order to learn the secrets of painters working there. Settling in rural Tver province, Venetsianov devoted his life to painting landscapes of the region and portraits of its peasantry. Eager to share the pleasure of art with others, he set up painting classes and had among his students the talented serf Grigorii Soroka.

Were Shchedrin and the other Russians working in Italy émigrés, seeking political or artistic freedom that had been denied them at home? Far from it. Nearly all had been sent there to study and were living on fellowships provided by the Imperial Academy of Arts

in St. Petersburg or the Society for the Encouragement of Artists, a kind of foundation closely connected with the Academy. High officials and even the Czar himself visited the artists in their studios in Rome. For Russians to keep abreast of the latest developments in European art was viewed as being fully compatible with autocratic rule at home.

The very existence of the Imperial Academy sets off Russian art from American art of the same period. True, Samuel F. B. Morse in 1825 had founded the National Academy of Design, but without governmental support and without the intention of monopolizing the field. Americans, with their tradition of pluralism and private initiative, would have looked with suspicion at any institution seeking to become a national harbinger of taste.

Not so the Russians. Most of the painters shown at the Renwick were somehow connected with the Academy of Arts, whether as professors, students or alumni of provincial schools or classes linked with the Academy in St. Petersburg. France, Austria and other West European nations had their academies, of course, but no other academy embraced so large a percentage of the artistic community as did Russia's; nowhere did it do more to promote the arts; and nowhere was the existence of a centralized academy less resented by the artists themselves. In France, academy baiting had been in style since the 18th century, when Voltaire and Rousseau attacked academic dogmatism and hostility to innovation. In Russia, such criticism did not become à la mode until the 1860s.

Like academies elsewhere, Russia's fostered technical competence through a rigorous preparation in still-life and figure classes. Since the Academy was situated within view of the Hermitage, recently expanded by Nicholas I, its students were daily exposed to some of the world's masterpieces. No snob school, the Czar's Academy accepted students from the most humble backgrounds, provided they had talent.

*The artist as professor*

In return, the Czarist government expected the artists to produce a steady flow of historical paintings on nationalistic themes and works on military subjects. Portraiture was esteemed, too, but only a historical painter could be honored with the title of "Professor" and receive the top salary.

Many of the painters represented in the Renwick's show had cut their teeth on these official genres. Thus, Vasilii Timm presented the *Revolt of 14 December 1825,* showing the young Czar Nicholas I in the process of putting down the abortive coup d'état that nearly ended his reign before it began. Many other painters devoted long years to depicting deeds of na-

Russian Museum, Leningrad

Aleksei Venetsianov's *Girl in a Shawl;* the artist devoted himself to landscape and portraits of peasants.

Russian Museum, Leningrad

Venetsianov's *Fortune-Telling with Cards,* 1842, shows his love for, and mastery of, Italian painting.

tional significance on a vast scale, and pursued portraiture and landscape only in their spare time. Briullov, for one, produced an enormous painting depicting *The Last Day of Pompeii.* No chauvinistic Russian would have had any doubt that it was an allegory of the impending collapse of a decadent West.

That Russia's artists were keenly nationalistic in the decades after 1812 is not surprising. After all, the defeat of Napoleon had set off a wave of patriotic fervor that even the existence of serfdom in an often repressive autocracy did not diminish. This patriotism found expression in other media besides painting. The composer Mikhail Glinka penned his opera *A Life for the Czar* during those same years, and a national anthem besides. The novelist Nikolai Gogol, too, sang the praises of Holy Russia and denounced its foreign and domestic critics as misguided.

Later, all this was to change. But under Nicholas I, Russia experienced a kind of golden twilight of autocracy. The artists translated this moment into visual terms. Yet had they done no more than this, they would scarcely be remembered today. What Russian artists managed to do for the first time in the early 19th century was to give dignity to art as such—independent of its ideological "content." Hence, we are drawn more to Briullov's *Princess Saltykova* than to his *Last Day of Pompeii,* to Soroka's or Shchedrin's landscapes than to Grigorii Chernetsov's *Parade on the Occasion of the Dedication of the Monument to Alexander I.*

By the emancipation of the serfs in 1861, Russia's artists no longer felt so comfortable skirting what had become known as "the social question." Abolitionists after the fact, many younger artists began depicting the peasantry not as innocent rustics, as had been done earlier, but as noble victims of oppression. Still nationalists, these same painters of the later 19th century also hoped for the solution of Russia's deepening problems through the unification of all Slavic and Eastern European peoples under a liberating Czar. To make these points, they rejected the various neoclassical and romantic styles that earlier had proved so fertile, and turned instead to what they called "realism." We would call it "realism with a message." No longer was the painting an end in itself, but the bearer of a kind of sermon or political homily.

It is hard not to be stirred by the social issues that impelled many of Russia's artists in the later 19th century. The starving peasants, the "true" Christians suffering for their faith at the hands of a cynical government, the self-sacrificing student revolutionaries—such themes naturally evoke sympathy. But what a contrast to Russian art of the earlier 19th century! As Barbara Shissler puts it, "The freshness and directness of appeal of these paintings is irresistible. From the brio of a Briullov portrait or the dappled, checkered shade of Shchedrin's arbors to the hushed silence of a Soroka landscape, where all movement has been transmuted into a gently ordered still life, these paintings provide magic vistas on a Golden Age whose charm we are only beginning to know and appreciate."

Few visitors to her exhibition would doubt that she is right.

Russian Museum, Leningrad

Rich and carefully composed study of fruit and flowers is by Ivan Khrutsky, painted in the 1830s.

Briullov's *Girl Gathering Grapes Near Naples.* His work other than portraits was not always admired.

Russian Museum, Leningrad

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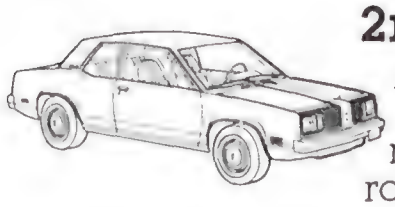

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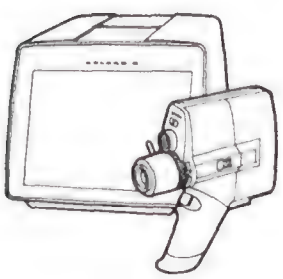

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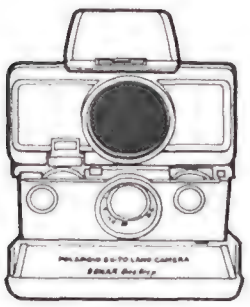

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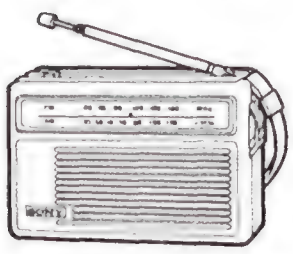

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Dohány Street Synagogue, nucleus of the community, seats some 3,000 worshipers. It was built in 1854.

*Text and photographs by Howard Sochurek*

# Matzoh, wine, salami—and piety—still flavor this wartime ghetto

One of many courtyards in the old ghetto area contains a kitchen (in corner) serving free meals to needy.

*In Budapest, where Nazi horror came late, a traditional Jewish community lingers in old surviving courtyards and buildings*

Long after the Holocaust, long after the surviving Jews of Europe have left the rubble of their ancient communities, one former wartime ghetto in Budapest remains a center of religious life. The old-fashioned neighborhood clusters around the Dohány Street Synagogue, and just before the last Passover I visited it.

I am not a Jew. But like many others who were born before World War II and fought in it, I have followed the agony and terrible tragedy that befell the Euro-

pean Jews. And to me it is astonishing that any aspect of the wartime ghetto survives. I had seen ruins of camps and furnaces and other reminders of the Nazis. But what happened in Budapest? Mainly, the Nazis made their move late—little more than a year before Hitler was defeated.

Jews numbered some 800,000 in Hungary in the very early 1940s, and nearly a quarter-million of them lived in Budapest. After Hitler and emigration, those figures are down to 100,000 for the nation and 80,000 for the city.

In March 1944, the Nazis moved into Hungary seeking their "final solution" to the problem of Jews. Their technique was to work through the leaders of the Jewish communities, duping them into helping organize the roundups of people headed for labor or death camps. The propensity for "togetherness" made the German task relatively easy: the Jews tended to hang on to the sense of security that they found in each other's company. Having been forced together during centuries of discrimination, they often clung together on the way to the gas chambers.

The Nazis also found their program facilitated by starting it in the countryside. Here Jewish communities were small and readily controlled. It was relatively simple to herd the Jews together and ship them off to Auschwitz, Bergen-Belsen, Dachau and the other death camps.

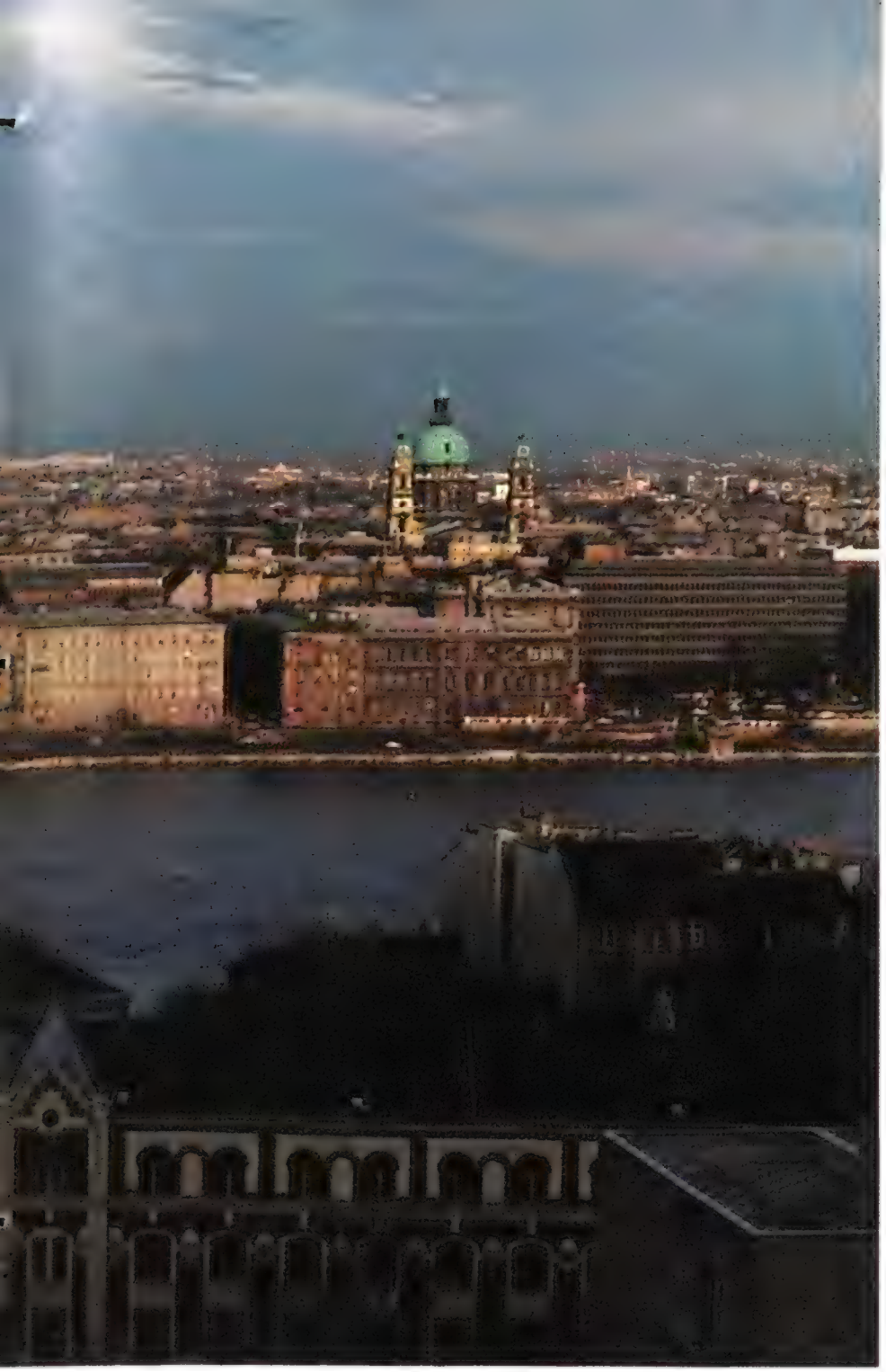
But in Budapest the job was more difficult. The numbers were large, and many of the people influential and important in the normal economic life of the city. For example, the Manfred Weiss Works, the nation's largest munitions enterprise—which the Germans needed—was turned over by its Jewish owners to the Third Reich. In return, 48 members of the family were allowed to emigrate to Portugal. After the war, the Russians took over the plant; it is now state-owned and renamed the Csepel Iron and Steel Works.

Across the murky-blue Danube from Buda lies Pest and, right, towers and dome of Dohány Street Synagogue.

In December 1944, shortly before the Russians drove the Germans out, Jews wearing their yellow stars were herded into specially assigned houses in an area designated as the Jewish ghetto. Residents and workers of non-Jewish origin were moved elsewhere. Despite Russian bombardment, lack of food, disease, street killings and constant harassment, some people of the Budapest ghetto managed to last out the war—69,000 were reported living there at the time of liberation—and the section itself was spared, the shops, synagogues and apartments.

One of the survivors is Dr. Ilona Benoschofsky, now in her late 70s, who runs the Jewish Museum, next to

*Howard Sochurek photographed and wrote about a new spur of the trans-Siberian railroad for* SMITHSONIAN *(February 1978).*



It marks the edge of the former World War II ghetto with its streets, shops, apartments and memories.

Beneath synagogue garden lie the remains of people who died in the ghetto before liberation in 1945.

Lights glow in some of these plaques, memorials to those who died during Hitler's "final solution."

A devout Jewish worshiper on the Sabbath wears the traditional *tallith*, or prayer shawl.

the Dohány Street Synagogue. She told me that in the early 1900s more than 800 synagogues flourished in Hungary. Today there are about 100 synagogues in the country, 30 of them in Budapest.

I walked the former wartime ghetto, visiting different places under the guidance of Imre Haber, president of the Jewish community. I saw the rabbinical school—old gray buildings housing classrooms for its 17 students, a medieval library, dormitories, a kosher kitchen. It is the only seminary of its kind left in Eastern Europe. Its head, Dr. Sandor Scheiber, met me in his sixth-floor office, a dark, lace-curtained room where he sat, fatigued from a journey, slumped in a leather chair, surrounded by smoke-stained portraits of his long-departed predecessors. Now he presides over, among other things, 120,000 books and documents, including 500 that are more than a thousand years old.

At Sabbath services, some women congregate and exchange gossip at rear of sanctuary. Men usually worship separately.

Young Hungarians learn the religious traditions of the Jews so that they can continue them.

For students enrolled in the six-and-a-half-year course, board and tuition are free. Some costs of religious institutions are subsidized by the state.

Dr. Scheiber is content with his life here, noting that traditional Jewish ways are being preserved. A plaque at the front door of the school notes that this was the first Nazi collecting station in the city; 20,000 went to their deaths from this place.

At the 200-bed Jewish hospital I met 74-year-old Dr. Pál Schwartzmann, the director, widely known for his work in geriatrics. He escaped from a slave labor camp in 1944, returned to Budapest and in return for medical services was hidden by friends in basement after basement until the German defeat. Now his budget is partly provided by the state. Some abandoned synagogues have been sold; some of the proceeds help maintain the hospital.

At 41 Kazinsky Street is the orthodox kosher salami factory. Here Dezso Kovari makes such fine kosher liverwurst and salami that even Seventh Day Adventists seek out his store. In a back room, beneath a half-hanging light tube, is the meat grinder. It's hot in there because cooking goes on nearby, and the salami is smoked on racks above a wood furnace.

Nearby is the orthodox bathhouse with first-, second- and third-class accommodations on the three floors. Only rainwater can be used, and bathers arrive there before sundown on Fridays in order to immerse themselves according to ritual.

Farther along Kazinsky Street is the basement wine shop where kosher wines from the Eger region are sold—semisweet wines that a foreign importer recently sought to buy. But the old winemaker said he would sell none of his 80,000 annual bottles for fear that they would not travel well.

The smell of cooking haunts the old streets and courts of the community. An orthodox communal kitchen serves 1,200 free hot meals each noon to old pensioners. One of them, 90-year-old Irene Schiller, told me she hadn't missed a meal in 30 years.

Young Jews are gradually preparing to take their places in the Budapest community as others, such as man in center, grow older. Out of 100,000 Jews in Hungary, some 80,000 live in Budapest.

On another street stands the matzoh factory, which works year-round making the thin Jewish unleavened bread (just wheat and water) eaten especially during Passover. Some 440 tons are shipped each year from this Jewish community to East Germany, Czechoslovakia and Poland.

This Budapest community has old and deep roots, but even here some of the strict religious traditions are beginning to give way before modern, more permissive practices. But there is one area where ritual has been carefully preserved. At the Kozma Street Jewish Cemetery, I was permitted to watch the ceremony of washing the dead. They arrive—four to six corpses a day—in a gray truck that comes from the state or Jewish hospital. They lie in simple, black, fiberboard coffins, with the tops open.

The bodies are taken to the bathing chamber to be prepared according to the ritual of purification called *taharah*. There are four attendants—two men for the males, two women for the females. They immerse the bodies in long horizontal vats filled with rainwater. Three times they dip the dead, and chant, meantime, "Clean! Clean! Clean!"

Each body is then dressed—wrapped in a pure white cotton cloth with no pockets, a prayer shawl for the men. White socks go on the feet; the arms are crossed over the chest. A small white pillow filled with sand supports the head.

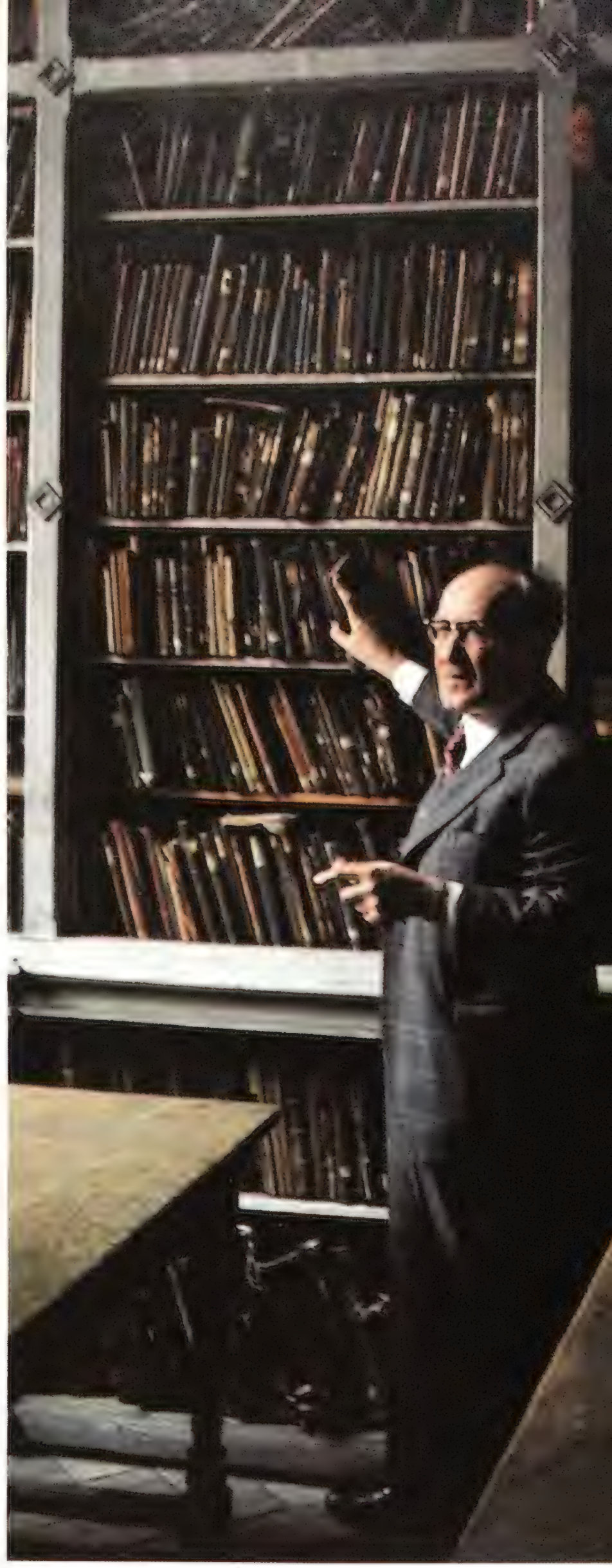
*Sabbath at the synagogue*

Some 600,000 Jews are buried in the Kozma Street Jewish Cemetery, and its written files go back to 1700. From far away, some Hungarian Jews seek a final resting place here, and porcelain urns filled with their ashes line the corridor of the morgue.

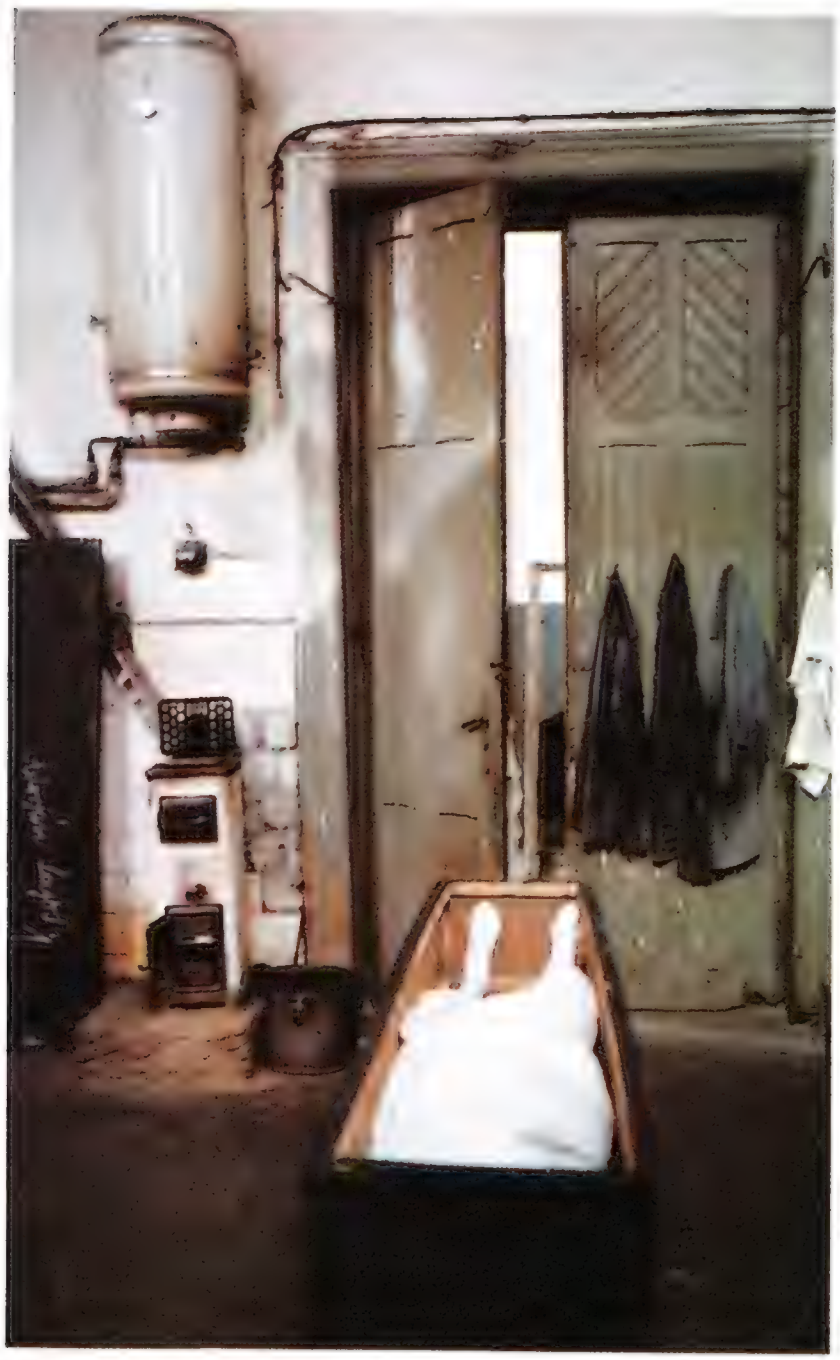
On a fine spring Jewish Sabbath, I attended the 10 A.M. service at the Dohány Street Synagogue. A huge Byzantine- and Moorish-style building, built between 1854 and 1859, it seats more than 3,000 people. American Ambassador Philip M. Kaiser attends services there. The synagogue is closed in the winter—too costly to heat—and then the congregation uses a smaller, newer synagogue adjacent to the big one.

I found about 200 people attending this Saturday service. Men sat devoutly in front, wearing their prayer shawls. Women, dressed in Sabbath best, were grouped at the back of the sanctuary, chattering back and forth, obviously feeling that this was a social as well as religious occasion. But the sermon held them.

I noticed when they broke up, after two hours, that most of the worshipers were old or middle-aged. I did see one young lad. As he left, he scrawled on a side wall, *"Jutka Szeretlek"* (Jutka, I love you), knowing that Jutka would be there next week.



Dr. Sandor Scheiber, 66, heads rabbinical school of Budapest, the only such seminary in Eastern Europe.



Wrapped in white, a body lies in an immersion room—one traditional procedure that has not changed.

A chicken plucker smiles in a kosher market. Salami, matzoh and wine are also produced in the area.

*By Henry Lansford*

# The frightening mystery of the electrical storm

*Meteorologists work to diminish disasters that thunder and lightning bring with them: hail, tornadoes, flash floods, downbursts*

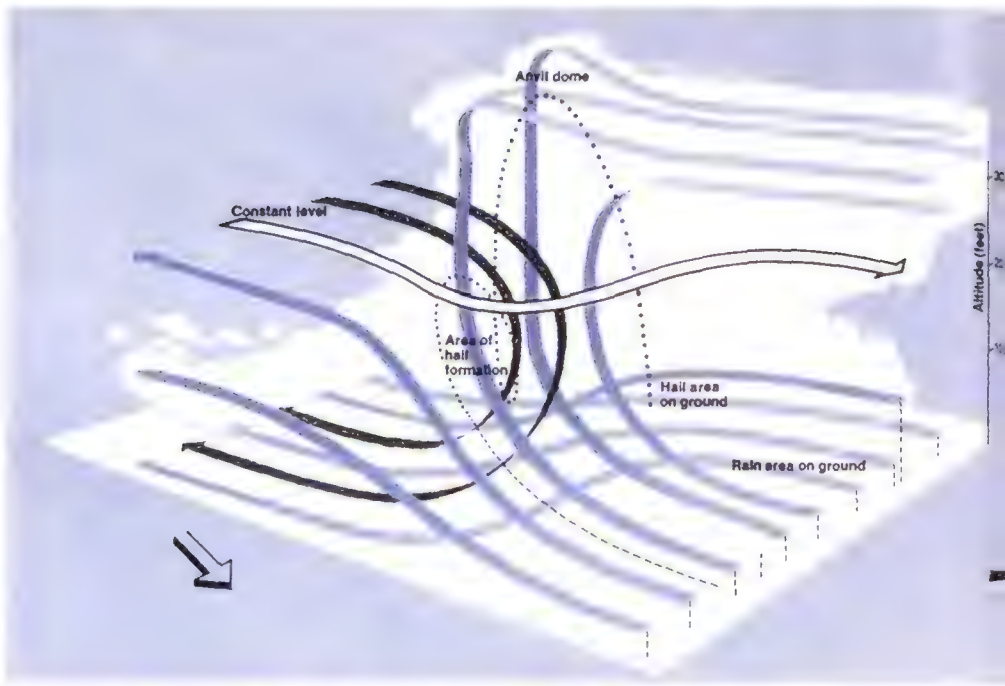
About suppertime on a Thursday in September 1970, strong winds and heavy rains hit Coffeyville, Kansas, as a thunderstorm moved in from the southwest. Hail began to rattle the rooftops, first with stones the size of mothballs, then with bigger and bigger lumps of ice: as big as golf balls and then as big as baseballs. When these gave way to hailstones the size of grapefruit, even the oldtimers went to the windows to stare. One of the stones measured just over 17 inches around and weighed 1.67 pounds, a new U.S. record (pp. 78-79).

At 4:30 on the afternoon of April 3, 1974, a day when spring thunderstorms were rumbling from the Great Lakes to the Gulf Coast, a dark funnel cloud swept from the southwest through Xenia, Ohio, a town of 25,000 some 15 miles from Dayton. The tornado cut a furrow of destruction almost 30 miles long and up to one-third of a mile wide, killing 30 people, damaging or destroying 2,400 homes and demolishing much of the business district. The Xenia tornado was one of the most destructive of more than 100 twisters spawned by the rash of severe thunderstorms during a 12-hour period. Altogether, more than 300 people died in the tornado outbreak of April 3 and 4.

June 24, 1975, was hot and smoggy in New York City. By 3:30 P.M. a line of cumulus clouds had moved into the vicinity of Kennedy International Airport, and thunderstorms were developing. Between 3:44 and 4:06 P.M., ten aircraft landed on Runway 22-L. Next in line was Eastern Airlines Flight 66 from New Orleans, a Boeing 727. About two miles out and 700

Internal lightning illuminates a thunderstorm while other bolts arc to the ground in this time exposure

made near Boulder, Colorado. Short lines at upper left are trails made by apparent motion of stars.




Classic diagram shows warm air rising, cool air descending in isolated thunderstorm. Line starting at right in dashes and becoming dots shows path of particle that will become a hailstone. Broad white arrow indicates a line of constant air pressure.

feet up, Flight 66 flew into rain. At 500 feet the rain grew heavy, and the windshield wipers were switched to high speed. At 400 feet the approach lights were visible through the rain. Then the plane's airspeed dropped abruptly as it was pounded down by a violent gust from above. At 4:06 the plane hit 2,400 feet short of the runway, killing 113 people.

Early on the evening of July 31, 1976, a huge thunderhead grew explosively over the Front Range of the Colorado Rockies near Estes Park. The storm dropped heavy rain on the upper reaches of Big Thompson Canyon, a narrow, scenic gorge. By 11 P.M., in this region where the average annual precipitation is less than 16 inches, more than 10 inches of rain had fallen at some spots. The Big Thompson River rose up over U.S. 34, the canyon highway, sweeping cars away and tumbling sections of pavement into the river. Bridges collapsed, riverside campgrounds vanished, and buildings dropped into the dark water. Weeks later 139 bodies had been recovered; some searchers believe the bodies of additional victims will never be found.

Around 8 P.M. on July 13, 1977, a thunderstorm moved across Westchester County, New York. At 8:37, lightning struck a transmission tower and short-circuited two power lines. Consolidated Edison's Indian Point plant on the Hudson River, which normally supplies 900,000 kilowatts to New York City, shut down automatically. An hour later another lightning strike short-circuited more upstate power lines. The sudden extra demand was too much for the rest of the system and a cascade of overloads and shutdowns began.

Within an hour the city and some of its northern suburbs were without electricity. It took Con Ed more than 24 hours to restore power throughout the system, by which time almost 3,400 people had been arrested for looting.

All five outbreaks—hail, tornadoes, turbulent winds, flash floods and lightning—were by-products of one and the same atmospheric phenomenon, known to meteorologists as the convective storm—and to laymen as the thunderstorm.

The damage and death inflicted by the five are serious enough to warrant major research. Consider:

- Hailstorms destroy around $700 million worth of crops each year in the United States and damage tens of millions of dollars worth of property.
- Between 1920 and 1973, tornadoes killed as many as 9,000 people, compared with 5,000 deaths from floods and 4,000 from hurricanes.
- Downbursts, the name that Professor T. Theodore Fujita of the University of Chicago has coined for violent vertical thunderstorm gusts like the one that hit Eastern Flight 66, have been implicated in a number of other crashes.
- Flash floods have recently emerged as the major killer among storm-weather hazards, largely because of urban development and recreational use of flood-prone areas. Since 1968 the average annual U.S. death toll from flash floods has risen to about 200.
- Although exact figures for lightning deaths are hard to come by, estimates range between 100 and 200 a year. Fires caused by lightning do at least $40 million damage annually and destroy in excess of $50 million worth of timber.

*A free-lance writer formerly with the National Center for Atmospheric Research, Lansford discussed climate trends in the November 1975* SMITHSONIAN.

Disasters aside, thunderstorms also bring life-giving benefits. The most obvious and important is the summer rain that waters crops and replenishes reservoirs. Based on a study of Mobile, Alabama, by Army engineers, Dr. Roscoe Braham of the University of Chicago estimates that such storms provide 80 percent of all the summer rain in the Eastern United States.

For all their awesomeness, thunderstorms are familiar enough in temperate and tropical regions. In 1925, the British climatologist C. E. P. Brooks estimated that at least 1,800 thunderstorms are in progress around the world at any moment. Others believe 3,000 to 4,000 to be more realistic. Millions of people who have never been in a hurricane have experienced hundreds of thunderstorms. On much of the Gulf Coast thunderstorms occur 60 to 80 days a year.

The thunderstorm season across the Southern United States usually starts in February and moves to the Midwest in March or April, when large-scale weather systems produce widespread outbreaks of severe storms. As Douglas Lilly of the National Center for Atmospheric Research (NCAR) puts it: "The most severe and damaging storms, especially, usually occur in some form of array." The storms that brought the killer tornadoes in April 1974 were part of a large-scale weather system.

*Energy equivalent to atomic bombs*

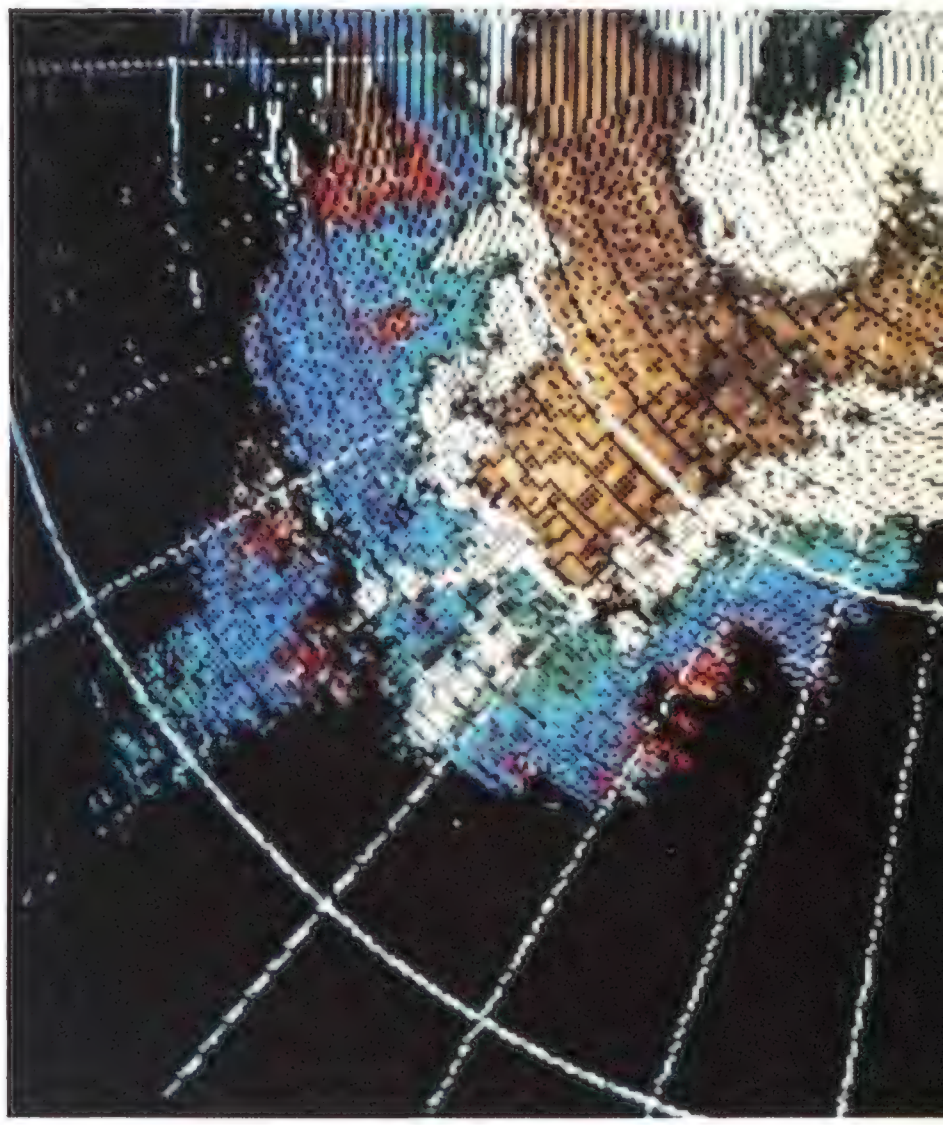
Isolated storms are more common in July and August, when the sun pours down huge quantities of radiant energy on the Earth's surface, energy that is then released upward into the atmosphere. These storms are truly spectacular in their solitary splendor. With a towering mass of water droplets and ice crystals as much as ten miles high and ten miles across, such a storm can contain half a million tons of water and release more energy than was unleashed by the atomic bombs dropped on Hiroshima and Nagasaki.

For all their familiarity, thunderstorms are marvelously complex in structure and behavior, and much of their physics and dynamics is not well understood. A major challenge to meteorologists is learning to identify and predict the factors that make the difference between a moderate storm and the kind of severe storm that can spawn tornadoes, hail and flash floods.

Before World War II, thunderstorms were pretty much a meteorological mystery. Little was known about their genesis and mechanics. But as commercial and military aviation developed in the 1930s and '40s, meteorology began to take on a more important role. During the early 1940s, as increasing numbers of aircraft were lost to violent thunderstorms, pressure began to build for more research on their causes and behavior. In the spring of 1945, Congress appropriated funds for thunderstorm research. A pioneer in aviation meteorology, Dr. Horace R. Byers of the University of Chicago, headed the project. World War II ended and in the words of Dr. Louis Battan, one of the project scientists who is now at the University of Arizona, "From all corners of the globe, meteorologists, technicians, weather observers and radar experts came home looking for something to do."

Working in Florida and Ohio, the team flew P-61 Black Widow night fighters into storms at varying levels of altitude. The pilots' instructions were heart-stopping: they were to achieve straight-and-level flight and then let go of all controls, letting the airplane itself be the instrument to measure the sometimes violent vertical winds inside the storm.

The first year, Battan says, cameras were installed in the cockpits to make sure the pilots had not touched the controls and thus compromised the measurements. But the film sometimes showed only a shoulder or elbow, not all of which could have been accidental. So the next year the controls were wired.



Sophisticated new radar reveals areas of different wind speeds inside a thunderstorm and displays them in arbitrary colors. A network of these radars could give longer warning times of tornadoes.

This hailstone, 17 inches around and weighing 1.67 pounds, is the largest ever found in the United States.

No planes were lost and no one was hurt, but there were some good scares. In one incident Battan recalls, three planes flew into a storm at 6,000, 10,000 and 15,000 feet. Suddenly the pilot of the highest plane screamed: "Control, Control . . . I cannot control the airplane. Get me out." Ground controllers gave him a course to steer and moved the other planes out. A few seconds later the pilot radioed: "I'm OK at 10,000 feet." Then he followed up: "Correction. The altitude is 20,000 feet." He said later it had felt as though he had hit a brick wall and assumed he had dropped a mile. Instead, he had been thrown a mile straight up.

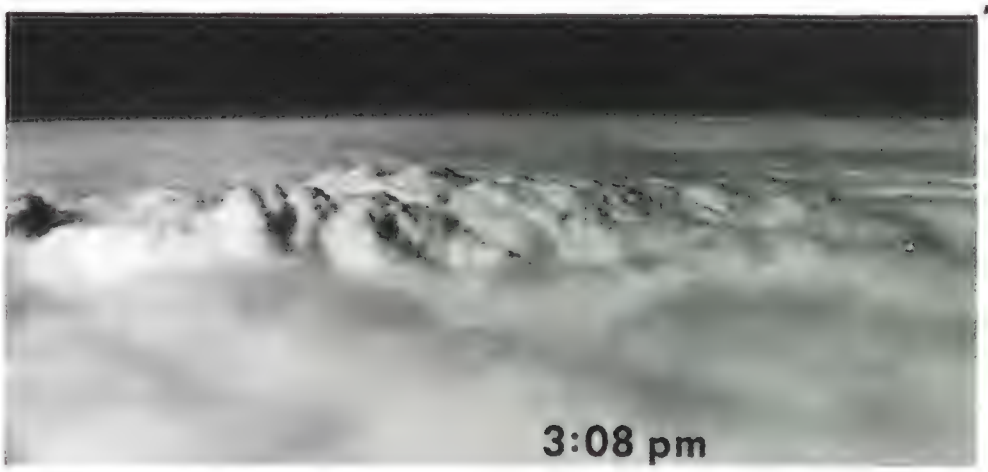
The information gathered by those pilots is still regarded as definitive for the isolated thunderstorms they probed. Data from the Thunderstorm Project and subsequent research allowed atmospheric scientists to develop a basic model of the structure and life cycle of isolated storms (p. 76). They know what happens, although they still don't know why. Dr. Braham, who worked on the project, explains: "We think of thunderstorms as cumulus (the little puffy clouds of summer) gone wild. Fundamentally, these clouds represent the boiling of the atmosphere as hot air rises and turns the air over. Why do some clouds run wild? Why don't we get just a lot of little clouds instead? We don't know."

The basic ingredients of an isolated air-mass thunderstorm are fairly simple. There must be plenty of moisture in the atmosphere, up to a level of 10,000 feet or higher. The surface of the ground and the air just above it must be well heated by the sun. And the atmosphere must be unstable, which means that the air at higher levels must be a great deal cooler than the air at lower levels.

When these conditions exist on a hot summer day, small cumulus clouds often start to form in the early afternoon. They are produced by air that is heated near the ground and begins to rise. It cools as it rises and its water vapor condenses into tiny droplets that form clouds.

Then several of the smaller clouds may come together and start to grow larger, forming a column or "cell" of rising air. If the air temperature decreases sharply enough with altitude, and if enough moisture is available, many cloud droplets will form. As they condense, they release more heat that accelerates the upward motion. The first phase of thunderstorm development is under way: the cumulus stage.

As the cloud grows, it draws in more air. If that surrounding air is moist, it feeds the growth process, and the cloud grows into a good-sized cumulus congestus: a large, roughly dome-shaped cloud with a soft,




In picture made from plane at 45,000 feet, dome structure shows at top of mature thunderstorm.

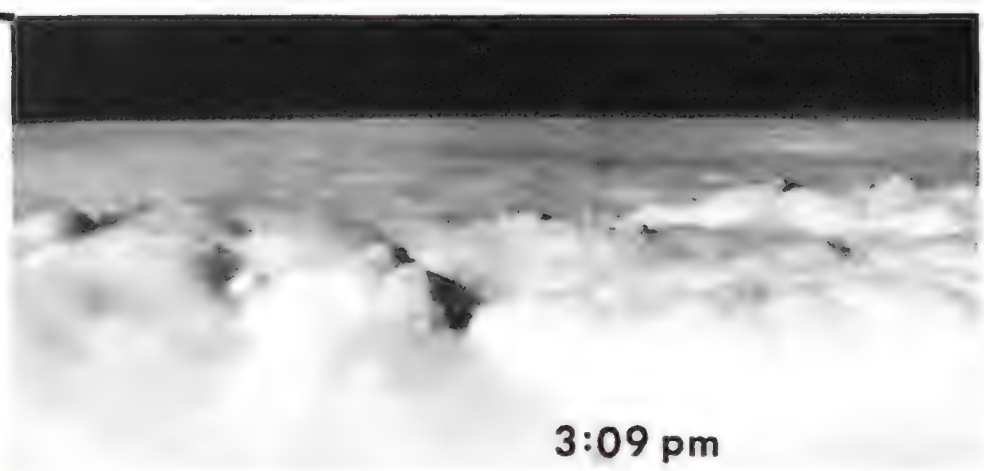
A slice of the same stone, here photographed in polarized light, shows intricate crystal structure.

mounded top and a flat bottom. Battan describes the cumulus congestus as "the egg from which a thunderstorm is hatched." Inside the cloud, the tiny droplets are coming together to form raindrops, and ice crystals are forming in the upper levels of the cloud, where the temperature is well below freezing.

Rain, ice and snow particles are in constant motion, breaking up and combining as they collide. Some raindrops are carried above the cloud's freezing level and become hailstones, which continue to grow by accretion as they are buffeted about inside the cloud. As the waterdrops and hailstones become heavy enough to overcome the lifting force of the updraft, they fall through the cloud. If the hailstones are small, they may melt on the way down and mingle with the waterdrops to fall as rain. But if the updraft is strong and certain other conditions exist, the hailstones may grow large enough to remain solid as they fall to the ground.

By now the top of the cloud is above 30,000 feet, with the top 10,000 feet or so below freezing. Many of the droplets are still liquid, however, not having had time to freeze. The ice particles in the cloud probably play a role in separating positive and negative electrical charges, although there is much controversy over the processes of cloud electrification. We do know that different parts of the cloud begin to accumulate different electric charges, building up the potential for the sudden discharges that we call lightning.

As raindrops and hailstones fall through the cloud, they cool the air, which starts to sink as it grows heavier, creating a downdraft. Now the cloud is in its mature stage, with a warm updraft still rising strongly on one side of the storm and a cold downdraft descending on the other. (Battan recalls the flier who bailed out of a plane in a thunderstorm a generation ago. "He spent 40 minutes in that storm," Battan says, "being carried up and down by the updrafts and downdrafts.")




A minute later, dome collapses into horseshoe crater. At same moment a tornado formed at base of cloud.

*The short, violent life of a thunderstorm*

This, then, is the thunderstorm at its most violent, with heavy rain, lightning, strong winds and possibly hail and tornadoes. Its top may reach to 50,000 or 60,000 feet, and the updraft velocity may be 50 or 60 miles an hour. The temperature at the top of the cloud may be as low as minus 60 degrees, and the ice crystals that form the cloud top will probably spread into an anvil shape as they are blown off.

The mature stage lasts only 20 or 30 minutes. Then as the downdraft grows larger and the updraft diminishes, the storm loses its source of energy and begins to dissipate. The rain slackens and the winds drop. The cloud begins to break up as the descending air loses its liquid to evaporation. Soon it is over.

This is a highly simplified and idealized description of the least complicated type of thunderstorm. Single thunderstorm cells may grow in succession next to one another, however, creating a longer-lived "multicell" storm made up of a series of single cells in successive stages of growth, maturity and decay. From the ground the multicell storm is seen as a single, continuing entity, constantly building on one side as it dissipates on the other. The Big Thompson flood resulted from a storm of this type.

Another kind of long-lived thunderstorm is the "supercell" storm, in which the updraft and downdraft stay more or less in balance, with the updraft fed by a continuing supply of moisture from the surrounding atmosphere. If conditions are right, the supercell

storm may maintain this steady state for hours. It's the supercell storm that often spawns the most intense tornadoes, like the one that struck Wichita Falls, Texas, this past April 10, killing some 60 people.

Another type of severe convective storm—one that can also destroy towns with tornadoes and crops with hail—occurs in systems known as squall lines. Although many squall lines occur along cold fronts, where a wedge of cold air undercuts a warmer air mass, there does not seem to be any single explanation for the tendency of thunderstorms to line themselves up.

In fact, there is still a lot of critical information about thunderstorms we would like to have. Much recent research has been focused on the prediction of large thunderstorm systems. The Wichita Falls storm was monitored by weather stations and radar set up as part of the SESAME (Severe Environmental Storms and Mesoscale Experiment) Project. Douglas Lilly, a member of the SESAME steering committee, says the regional-scale network, centered at the National Severe Storms Laboratory in Norman, Oklahoma, was deployed to try to define how large and dense a network of weather stations will be needed to predict such storms.

Even if the time and place of severe storm outbreaks can be predicted, it may never be possible to forecast the actual tornado touchdown hours in advance. But every minute of warning time can save lives. According to Allen Pearson, director of the National Severe Storms Forecast Center in Kansas City, the technology exists to increase the warning time for tornadoes from the present 5 to 10 minutes to as much as 30 minutes. That tool is Doppler radar, which measures wind circulation inside storms and can identify characteristic patterns that indicate a tornado is forming.

Just after the Wichita Falls outbreak, Pearson said: "Nobody should ever be killed by a tornado, and 60 have been killed already this year because we're using antiquated, old-style radar." The National Weather Service disagrees, saying that warning time was not the problem.

A radar "signature"—a characteristic pattern on the screen—may eventually provide warnings of downbursts, according to Clifford Murino of the National Center for Atmospheric Research. Murino heads NCAR's Atmospheric Technology Division, which supported Fujita's research. Fujita says that at least five downbursts strong enough to threaten an aircraft occurred during a field research program last year. Two of them were right over the project field station, and Fujita says, "Once I was almost blown into the lake, so I have proved their existence."

Fujita believes that some of the damage attributed to tornadoes, especially at night, is really the work of downbursts. The large ones, he says, may last as long as 30 minutes and inflict tornadolike damage along a 100-mile swath. But it is the small ones he calls microbursts that are most dangerous to aircraft. When a large downburst is producing violent winds over a large area, planes do not try to take off, he says, but the small ones cover only two or three miles, about the size of an airport, so there is usually no warning.

What about modifying thunderstorms by cloud seeding or other techniques? Many atmospheric scientists regard the results of such efforts over the last 30 years as highly questionable. NCAR, for example, managed a hail-suppression experiment in which cloud seeding was tested for three years: the results were ambiguous.

We have come far since the 1930s, but we still have a long way to go to understand thunderstorms. In the meantime, we can learn to take precautions—and to appreciate the most awesome natural violence many of us will ever see.

Cumulus clouds, left, form under same conditions as violent storms. A mature storm, center, boils up into a clear sky. High-altitude winds blow top into anvil shape, right. Opposite is Everglades storm.

# "HOW I BOUGHT A VOLVO WAGON AND LOST 1,000 POUNDS OF UGLY FAT."

*By Pat Fellman, as told to Volvo.*

"You wouldn't know it to look at me now, but I used to have a wagon that weighed two tons and felt a block long.

I thought that was the price you had to pay if you were a wife with kids, dogs and groceries to haul around.

One day, my oldest daughter, who had become very energy conscious, said, 'Mom, what are you driving that big thing for? Why don't you get something smaller?'

Then and there, I decided to lick this weight problem of mine.

First, I looked at the little station wagons. They felt tinny and unsafe. And they didn't hold much of anything.

Then I looked at the Volvo wagon. What a shock! It had almost as much room in back as the monster I'd been driving. Yet when I drove it, it handled more like my husband's sports car. It felt safe, solid, maneuverable. It was easy to park. And I could look over the steering wheel instead of through it.

Somehow, since buying that Volvo wagon, I feel more liberated."

Statistics show that 9 out of 10 people who have bought new Volvos are happy.

Why not follow the Volvo weight reduction plan yourself?

You have everything to gain.

**VOLVO**

A car you can believe in.

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*"Before. I used to have to wrestle with a beached whale. No wonder I felt tired all the time."*

*"This is me after losing half a ton. I feel like a new woman."*

Raccoons lead the way to new wildlife-style.

*By A.B.C. Whipple*

# *The raccoon life in darkest suburbia*

*Many neighborhoods are discovering that in any test of wits with* Procyon lotor *suburban Man is likely to be second*

At first we thought Old Greenwich, Connecticut, was experiencing an unprecedented wildlife population explosion. Deer feasted on neighbors' trees. Squawking pheasants woke us at dawn. Rabbits proliferated wildly, even for rabbits. Migrating Canada geese settled on our shores and refused to fly farther south or return north in the spring.

All we were witnessing, however, was a trend noticed by suburbanites throughout the United States, as squirrels and skunks, wild turkeys and woodchucks—indeed, all manner of wildlife—joined the rush to the suburbs. But the most intrusive invader, in our neighborhood and evidently in others, has been the raccoon.

When raccoons swarmed into a bucolic Washington, D.C., neighborhood, one resident's ingenious solution

*Illustrations by Ronald LeHew*

Washington raccoons are sent off to Virginia.

to the problem was to transport her captured raccoons to northern Virginia for, according to a newspaper columnist, " a new and better life among the nuts and berries." Meanwhile, it develops, suburban Virginians have been trapping their raccoons and releasing *them* in Washington's Rock Creek Park. In a sobersided monograph entitled *The Ecology of Urban Raccoons in Cincinnati, Ohio,* published in 1974, two University of Cincinnati biologists, James R. Schinner and Darrell L. Cauley, reported on a 27-month study of the suburban raccoon in which they prowled the Cincinnati suburb of Clifton and concluded, after "a total of 3,452 trap nights," that the Cincinnati suburb was "ideally suited for maximal raccoon activity," and that "garbage is an important food source."

I could have told them that. A second such report on suburban wildlife, done by Mr. Cauley in Taylor, Michigan, a suburb of Detroit, also confirmed my observations. "Four hundred seventy-eight trap nights were recorded for raccoons," Mr. Cauley reported, "with a total of nine captures, for a capture frequency of 1.9 percent." In other words, most of the raccoons were too smart for the traps.

It has been my own experience that in the contest between the wily raccoon invader and its wary human host, the former has usually demonstrated a quite superior intelligence. Indeed, the species *Procyon lotor,* in Old Greenwich anyway, has outwitted, baffled, frustrated and enraged Homo sapiens often enough to make one question the accepted translation of sapiens. Both scientific studies proved that there are a lot of raccoons in the suburbs; in Clifton there were as many as one per 1.4 acres, nearly as high a population density, to borrow the phrase, as has been found in the wilds. And they do get around; one Taylor raccoon covered a 64-acre feeding area. I could have told the biologists that, too. For some months I have been conducting, involuntarily, my own unscientific study of *Procyon lotor.* The central site of my study is a garbage-well with a step-on top, located at our back door. For more than 20 years it has foiled every dog in the community. It had also been too much for the raccoons, until recently.

It could, I suppose, be an example of evolution in action. For whatever reason, our evening quiet was increasingly broken by a clanging of the garbage can lid. Inspecting the site one night, I found the lid closed, but I could hear unmistakable shuffling noises within the recesses of the garbage can. As I approached it, the top opened, lifted by the head of a large raccoon which nimbly climbed out, glanced my way with what I took to be a look of gratitude and sauntered away.

In hindsight, I realize that it was a look of benign contempt. Evidently our garbage was not up to the standards of the habitat, because on subsequent nights our visitor took to hauling the plastic bags from the can and distributing the contents about the driveway, evidently to facilitate the selection process. Studying the detritus, I almost concluded that the raccoon was laying out the courses of its dinner; one morning I found a spread of shrimp shells followed by clean-picked chicken bones followed by cheese and crackers followed by a cigar butt. To defend our

*A.B.C. Whipple, who claims no previous experience as a naturalist or wildlife enthusiast, is author of recent books,* Vintage Nantucket *and* The Whalers.

garbage from these nocturnal depredations, I engaged in a battle of wits with my visitor. I should have known better. Heavy rocks atop the garbage can, moth flakes, sprays, "raccoon-proof" clamps, have all been easily disposed of by our visitor. As I write, the battle appears to have reached a stalemate. A hinge on one side of the can, a hasp and clip on the other side, a spring lock across the can top, and a hood over the rack have combined to protect our garbage—but only temporarily, I'm sure. With fingers bandaged from cuts incurred while drilling the hinge holes, insomnia caused by listening through the night for further incursions and a numbing realization that I have met my match, I await the next attack. Most ominously, our one visitor has multiplied to half a dozen. Moreover, no one else in my family can open the garbage can, and the garbage collector is annoyed at the extra time it takes him to work the combination on his rounds.

The experience has, however, taught me a great deal about *Procyon lotor*. Although its greatest activity begins around 2 A.M., it has been instructive, on the nights when I have managed to keep awake, to observe the raccoon in its suburban habitat.

The most casual observation dispels one or two of the most widely accepted raccoon myths. The raccoon does not, for example, have that marvel of evolution, the opposable thumb—not yet, anyway. But it has so perfected its ability to grasp with its two outside claws that the result is nearly the same. A raccoon lifting the top of a trash can exactly resembles a human lifting a pot lid. A raccoon sifting through its dinner with its handlike paws would shame a child.

### *A mythical repute for hygiene*

But, to dispel another myth, the raccoon is far from the dainty, hygienic creature of legend, delicately washing every bit of food and cleaning up its debris. A selective feeder it is; neat it is not. So widely accepted is the notion of the hygienic raccoon that part of its name, *lotor*, is Latin for "washer." (*Procyon* is the Greek name for a double star that rises before Sirius, the dog star, and was given to the raccoon when it was discovered not to be a dog, as had previously been assumed; in fact, the raccoon is more closely related to the panda.) The assumption of daintiness came from the raccoon's habit of dipping its food in water when water is available. The raccoon does not do this to clean its food; indeed, it frequently urinates in the same water.

No one has convincingly explained the raccoon's "washing" behavior; the most likely suggestion is that it is a hangover from the raccoon's earliest hunting methods, which consisted of feeling along the bottom of a stream for crayfish and similar prey. Given the opportunity, and a lack of convenient garbage, the raccoon still gropes underwater for food. In the process it does not look at what it is doing, but evidently watches for predators.

If daintiness is not one of the raccoon's attributes, gluttony is. The raccoon is omnivorous, readily eating berries and baby birds, corn and crayfish, moles, voles and garbage. One of the few things it will not eat is the tomato, evidently because of its high acid content. I doubt that even a teen-age boy's appetite matches that of a raccoon. But with intelligence superior to that of most teen-age boys, the raccoon suits its feeding to the season, preferring protein-rich foods during spring and summer when it is most active and carbohydrates in autumn when it is storing up fat for its winter sleep.

The raccoon does not, however, hibernate like such animals as the opossum, whose temperature drops and metabolism slows throughout the winter. In northern latitudes the raccoon retires to its den for most of the winter; wisely, it hates to walk in the snow. Its hideaway usually is a hollow in a tree, but it can also be a small cave. During the winter period the raccoon sleeps for days or weeks, but awakes when the temperature rises above 28 degrees F, to forage again. Our garbage collector was as sorry as I was to hear that.

By spring the raccoon is lean and hungry, having lost nearly half its weight. But it shortly remedies this

Man's feeble stratagems fail to foil nocturnal raids.

situation. By early summer a full-grown raccoon is nearly three feet long and weighs about 15 pounds. By autumn, through the largess of its improvident human neighbors, it eats as much as four pounds of food every night, and nearly doubles its weight. One that may be a record size weighed in at 62 pounds; it was four feet seven inches long from nose to tail tip. The largest raccoon in our habitat more nearly resembles Wodehouse's famous sow, The Empress of Blandings.

Once it is full grown, the raccoon fears few predators. I wondered why the many dogs in our area did not help thin the raccoon population, if only by occasionally stumbling onto one. But I realized why when one night *I* stumbled into the path of a young raccoon and was attacked by its snarling, fang-baring mother.

For a raccoon to outwit and out-bluff the singularly inept dogs of our area is not surprising. But raccoon lore includes many accounts of the animal's superior intelligence. The most highly trained hounds have been baffled by raccoons that doubled and redoubled their tracks, ran along the tops of fences, climbed trees and leaped from one to another, and plunged into streams to lose their scent. Despite its shuffling gait, the raccoon can reach a top speed of 15 mph in short bursts. It can also lure a dog to its death. Plunging into a lake or pond, it swims out into deep water. When the dog swims after it, the raccoon circles its struggling pursuer, climbs onto its neck and holds its head under until the dog drowns.

The raccoon's intelligence is nearly matched by its strength and ferocity. One raccoon with a good foothold in its tree suspended in midair a 200-pound Yale professor who had grabbed it by the tail. A cornered raccoon backs up against a wall, rock or tree trunk to avoid being attacked from behind; and with its slashing claws and needle-sharp teeth it can disembowel or cut the jugulars of two or three dogs its size or larger.

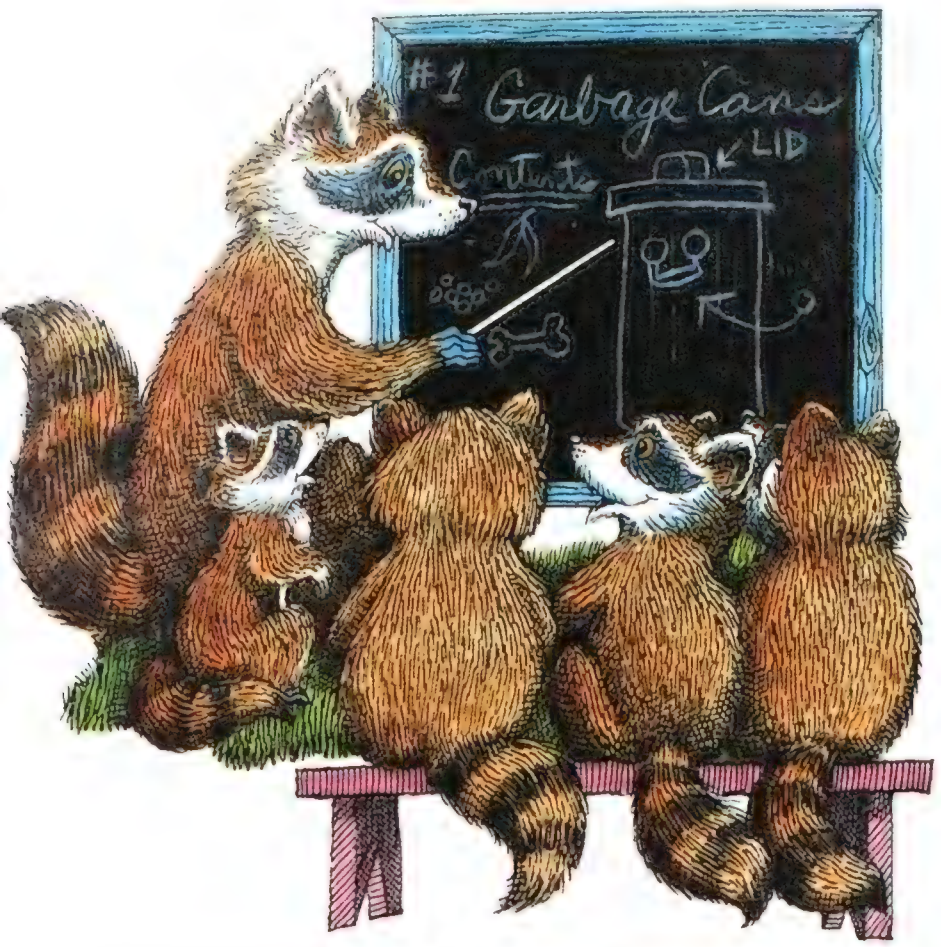
When not on the defensive, the raccoon is normally a friendly, if messy, creature. A sign of its intelligence is its highly developed curiosity which, combined with its highly developed claws, can make it an extremely annoying neighbor.

Raccoons have been known to lift a door latch, walk into a kitchen, open the refrigerator and help themselves. Raccoons can pry open windows, turn door knobs, turn on faucets (which they rarely bother to turn off), unscrew bottle tops and pull corks; on occasion, a raccoon stumbling home in the early morning hours like a returning drunk is just that.

Farmers are not amused by their raccoon neighbors, as corn, milk, honey and chickens are among the raccoons' favorite foods. In midsummer, at the time of what the farmers call the "corn-green moon," raccoons move methodically and efficiently through a corn field, opening the ears to see if they are ripe, and having a feast if they are. One raccoon regularly milked a farmer's cow. One bird lover watched a mother raccoon climb out on a tree limb, suspend herself by her hind legs and unhook a hanging bird feeder, sending it crashing to the ground in front of her waiting kits.

The raccoons' superior intellect tends sometimes to induce a sense of confidence bordering on bravado. A forest ranger claims to have seen a group of campers around a fire joined by raccoons that gradually edged closer to the circle, their beady eyes registering supplication, until they were sitting with their hosts, enjoying the firelight and munching hot dogs. I have not yet seen a claim that they joined the singing.

Inept local hounds are as easily outwitted as humans.




After year of maternal tutoring, kits are turned out.

They do give voice, in churring undertones and chirping calls. A raccoon can hiss like a goose, growl like a dog, snarl like a tiger and screech like an owl. A tame raccoon will, when stroked under the chin, purr like a cat. But when confronted with danger, a raccoon can emit a scream that would shame a banshee.

Raccoons not only are capable of mastering door latches, locks and even zippers (which often are beyond my capability), but also have done extremely well, in psychologists' studies, in mazes and multiple choice tests. They learn quickly, have good memories and improve with age. Certainly *Procyon lotor Old Greenwich* evidences many symptoms of intellect superior to that of *Homo sapiens Old Greenwich*. The male raccoon, for example, is openly polygamous; few of the male humans in our ecosystem are quite so frank about it. In a behavior pattern perhaps similar to that of some of its human counterparts in the city, the male raccoon sets out in early spring and prowls from den to den in search of a temporary mate. Occasionally males will fight over a female in front of her den, but the female is the one that makes the choice. The pair thereupon den-up for a week or two, after which the male, exhibiting signs of fatigue, goes on his way.

The female feeds voraciously during the first few weeks of her 63-day pregnancy, then holes up in her den to give birth to two to seven kits. At birth they weigh about two ounces and are blind and helpless. Within three weeks, however, their eyes are open and their raccoon mother is taking them out for walks, to learn about their habitat. She devotes the next few weeks to teaching them how to grope for crayfish, crack birds' eggs and, in our area, open garbage cans. The youngsters learn fast. The mother weans them by the time they are 14 weeks old, no doubt because their sharp teeth are beginning to appear. The fatherless family generally stays together through summer and autumn and sometimes into the winter, until the mother drives her children out on their own and prepares to examine the new season's suitors and select the father of her next family. Barring accident or disease, her kits will live about ten years.

She and her ancestors have been bringing up their families this way for more centuries than humans have. Raccoons, my wife reminded me at the height of my angry frustration, were in the New World before we were. Indeed, they exist only in the New World, and have been here for 30 million years. Captain John Smith first mentioned the "Aroughcun" in his dispatches in 1612, and the early settlers were shortly complaining about the raccoons' eating their corn. The settlers also found an intriguing use for this odd creature: its penis contains a bone, called a *baculum*, in the shape of a reverse curve which made an excellent pipe cleaner.

*Wrapped in tails for winter*

Like everyone since, the settlers were impressed by the raccoon's ingenuity and gumption, one observer even claiming to have seen a raccoon fishing for crabs with its tail. Another of Man's reactions was characteristic: he started killing it. A raccoon's meat is too fatty to be very palatable. But its dense fur provided excellent protection during the North American winters. The first raccoon coat of which I have heard was worn by the Indian chief Powhatan as a mark of his eminence. It was adorned with raccoon tails, a design that, unfortunately, did not survive to the days of the coat's later popularity on the campus. The raccoon itself recognized the warming properties of its distinctive ringed tail long before the trappers did. When the raccoon lies up for a spell of winter, it curls itself in a ball, with its warm tail wrapped around most of its body, providing nature's finest insulation. Humans found the tail equally comfortable when left on a raccoon hat and wrapped around the neck. Some settlers in effect wore an entire raccoon, with its face in front and its tail dangling at the back of the wearer's neck. Raccoon hats were waterproof as well as warm.

Despite 19th-century trappers and 20th-century flappers, the hardy raccoon has survived in all the continental states, evolving into at least 19 species and subspecies ranging from diminutive three-pound

creatures in the Florida Keys to 30-pound monsters in Maine and Minnesota (Texas also claims to have outsize specimens). There even is a wetback raccoon, *Procyon lotor mexicanus,* which swims across the Rio Grande into Texas. The famous naturalist Ernest Thompson Seton estimated that there were 5,000,000 raccoons in North and South America when the first settlers arrived. The best guess is that there are about the same number now. Thus the raccoon, unlike Man, appears to have achieved zero population growth.

More than nearly any other animal, the raccoon has managed to coexist with man without being domesticated, *i.e.,* enslaved. Captured baby raccoons make endearing pets. They can be taught all sorts of tricks and seem to enjoy the process. At maturity, however, which comes at about two years, raccoons make themselves so obnoxious that they are usually released. So long as they are free to come and go, raccoons will avail themselves of the advantages of human hospitality. One raccoon regularly called at its benefactor's back door and rang a dinner bell to announce its arrival. Another returned with a dozen friends; they formed a queue, each waiting its turn to be fed.

But modern raccoons, it appears, cannot live by bread alone. Most of them appreciate a good cigar, for example; and showing more sense than humans, they prefer rolling a lighted stogie in their paws to smoking it. Some also crave entertainment. One indulgent host claims to have been regularly visited by a raccoon that sits on his sofa watching television, yawning during commercials and on occasion going over to the set to switch channels. Another TV owner is visited by a raccoon that especially likes ballet. Raccoons do not care whether the television is color or black-and-white; they are color-blind.

But the most convincing testimony I have heard to the natural intellectual superiority of the raccoon is sworn to by a music lover who claims that a neighborhood raccoon is a Beethoven fan. It prefers the Ninth Symphony. When the Ninth starts booming through the open windows, the raccoon promptly comes out of the woods, unlatches the screen door, walks to one of the speakers and sits beside it, immobile and unblinking, until the last bars have sounded. Then it rises quietly, lets itself out and returns to the forest.

That, I suppose, is worth a lot of garbage.

One raccoon leaves woods for Beethoven's Ninth.

# The Atomic Bond.

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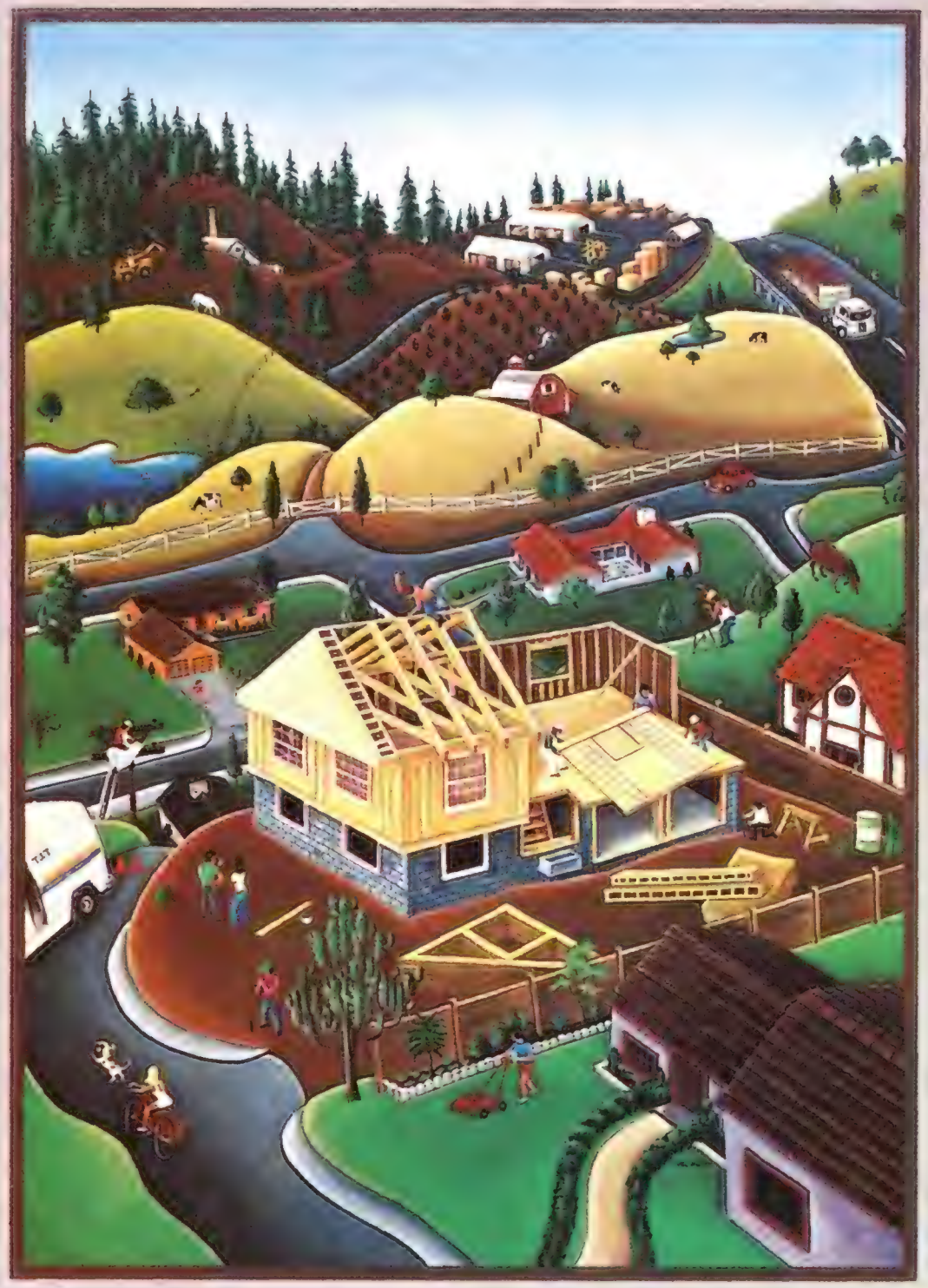

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A company worth looking at.

Bladderwort's semicircular trap, attached to stalk, has trigger hairs near mouth. When grazing, a crustacean, like the brown one at center, brushes hairs, trap springs open and animal is sucked in.

*By Donald R. Windler*

# A water plant with a taste for tiny beasts

*The bladderwort, an innocent-looking inhabitant of many U.S. wetlands, is a carnivore with some unique traits*

Animal-trapping plants have captured people's imagination since they were first recognized as carnivorous in the late 18th century. Although science-fiction writers have delighted in spinning tales of man-eating plants, small frogs probably represent the upper limit in size of prey. Insects are the most common victims.

In 1875, Charles Darwin published *Insectivorous Plants*, a book in which he reported what had been learned about these botanical curiosities in the previous hundred years. In it he referred to the Venus' flytrap as "one of the most wonderful [plants] in the world," yet had he known more about the bladderwort—a native plant which can be found in marshy spots almost anywhere in the United States but which is rarely recognized as a carnivore—he might have chosen it instead.

The traps of carnivorous plants fall into four gen-

*Photographs by Robert Noonan*

In spring, bladderwort uncurls, sends stalk up from pond bottom; as branches collect air bubbles, it floats.

eral types: the passive pitfall, the flypaper type, the steel trap and the mousetrap. In the passive type, the plant remains immobile and the structure of the plant is totally responsible for the entrapment. In the pitcher plant (*Sarracenia*), for example, the leaf is a hollow tube or pitcherlike structure. Insects are attracted by nectar secreted by glands located at the inner rim of the pitcher. Once the insects release their grasp of the rim, they plunge into a watery bath containing digestive enzymes, and are trapped by the slippery inner surface of the pitcher and by a dense zone of downward-pointing hairs.

In the flypaper type of trap, represented by the sundews (*Drosera*), the plant produces a circle of leaves near the soil surface. The leaves are covered with glands which are called tentacles if they are stalked, or *papillae* ("nipples") if unstalked. Insects landing on the leaves come in contact with the tentacles and are held fast by a sticky secretion. Over a short period of time other tentacles bend and attach themselves to the trapped crustacean. Nutrient material is then drawn into the plant leaf through the glands.

Probably the best known of the insectivorous plants is the Venus' flytrap (*Dionaea muscipula*), an example of the steel-trap type of mechanism. In this species the blade of the leaf is shaped like a circle with a crease down the middle and with a series of bristles along the margin. The circle halves quickly come together like a bear trap when prey touches trigger hairs.

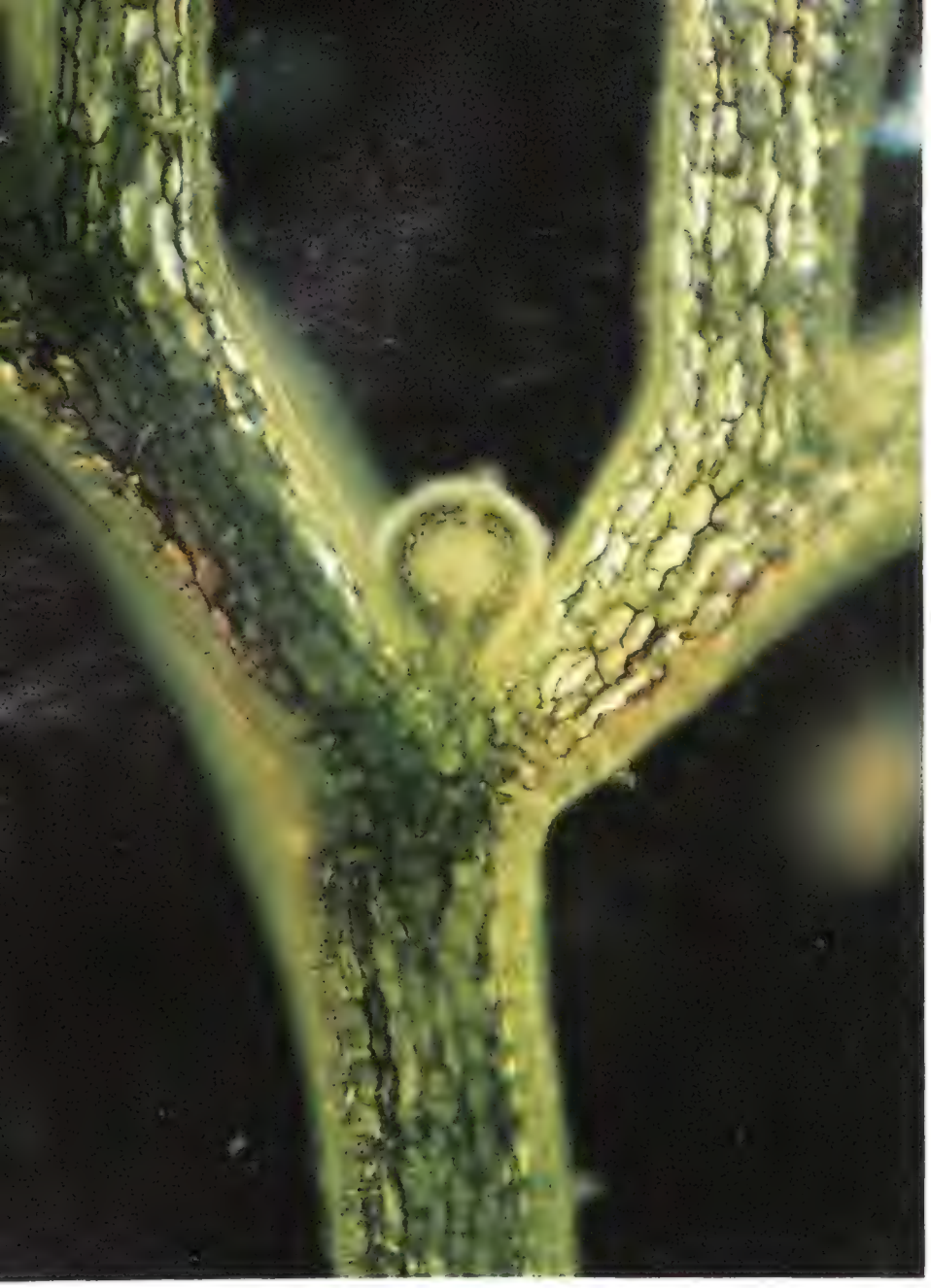
The last type, termed the mousetrap, is represented by the bladderwort (*Utricularia*). It is composed of a saclike chamber with a door. When the trap is tripped, the door rapidly opens inward, the prey is sucked in and the door then completely closes to prevent escape.

In Darwin's day the trap of the bladderwort was believed to be a relatively simple mechanism of prey capture, but it has been shown to be far more complex than he realized. It is one of the most intricate mechanisms in the plant kingdom.

*Utricularia* is a genus of about 300 temperate and tropical species which occupy moist land or watery habitats. In the aquatic species we find a combination of the insectivorous nature with the floating aquatic habit found in but one other genus of flowering plants, the *Aldrovanda* of the Mediterranean, the Orient and Australia. Aquatic plants, and particularly floating species, have a peculiar anatomy which reflects their adaptation to life in the water.

The floating *Utricularia* represent the ultimate in this trend. They produce leaves and stems which are not readily distinguishable and do not produce roots at all. When the famous German morphologist Karl Goebel studied the development of the plants, he found that the leaf segments, runners, and even the erect flower shoots are all fundamentally the same in structure. In most plants the position of a meristem, or

*Donald R. Windler is professor of botany at Towson State University in Maryland and author of* The Diversity of Plants, *a survey of the plant kingdom.*



Trap, magnified here 250 times, is formed at a fork in the stem, soon develops door and trigger hairs.

learned. The three-to-five-mm trap, which may represent a modified leaf segment, is stalked and usually pear-shaped with the stalk attached to the enlarged end. The door of the trap is attached along the top and sides, with the lower, free margin resting on a ridge of tissue called the threshold. When in a closed position, the door bulges outward. A membrane called the velum seals the margin of the trapdoor and prevents water from passing around it. Star-shaped glands which line the bladder extract water from it and cause a negative pressure to develop inside. After the water is drawn down into the stem, the door is delicately poised and the trap reset.

Around the entrance to the trap are found two types of plant hairs. Just above the doors, branched antennae which resemble threadlike algae are attached. At the sides of the door there are sets of unbranched threadlike bristles. Trigger hairs are located on the surface of the door. Darwin hypothesized that the branched and unbranched structures around the door served to funnel small organisms toward the trapdoor. More recently we have learned that the animals which are most commonly trapped feed by moving along algaelike filaments and grazing the surface. When they

growth zone, restricts the type of structure into which it will develop. In *Utricularа* any meristem may develop into any of the structures or begin to develop into one structure and then change into another, thus giving the plant maximum flexibility to take advantage of changes in the habitat.

The structure for which *Utricularia* are best known are the bladderlike traps attached to the finer branches. In 1633, Gerard's *Herbal* described them as "knobs hanging thereat like the sounds [air bladders] of fish." For more than 200 years this view of the bladders persisted in the minds of amateur and professional botanists until, in 1858, small beasts were reported to be found in the traps. In about 1875 Charles Darwin, Ferdinand Cohn and Mrs. Mary Treat, all working independently, came to the conclusion that the structures were actually trapping the animals.

In the century since, a great deal more has been

Flowering in May or June, most species have yellow blossoms, some of which last until November.

make an error and graze on the bristles around the trapdoor, they often come in contact with the trigger hairs. The trigger opens the seal along the threshold. Because of the negative pressure inside the bladder, water is sucked in, dragging the animal into the trap. Once in, the door relaxes against the threshold, preventing the animal's escape. The entire capture requires only thousandths of a second, by far the fastest trapping mechanism known. Tadpoles and young fish are sometimes reported to die after having their heads caught in the bladders. The usual prey, however, are tiny crustaceans.

Reproduction in the bladderworts proceeds by both sexual and asexual means. Flowers of the bladderworts are borne on erect shoots and are often very pretty, serving to attract pollinators. Although most of the species in the United States have violet or yellow flowers, other colors occur. Among the most striking are the red flowers of some of Australia's "fairy aprons."

Asexual reproduction in *Utricularia* is carried out by a structure called a turion, a mechanism restricted to a few genera of aquatic plants. The turion is a dwarf tip of a branch and is composed of a mass of crowded leaves on a short stem. The leaves of the turion are gorged with starch and have few air spaces. In late autumn a separation layer develops at the base of the turion. Any movement by wind or animals causes them to break free, whereupon they sink to the bottom with the stem end down, and become dormant for the winter. In the spring, the outer leaves begin to unfold and the starch stored within is converted to sugars that fuel new growth. During this process air spaces develop within the leaves, the turion becomes buoyant and rises to the surface to develop into a new mature plant, its traps set for the first unwary creature that brushes past.

As plant's traps digest captured crustaceans, snails will emerge from eggs (background) to feed on plant.

# Is America getting trapped by foreign steel as it is by foreign oil?

Last year foreign steelmakers shipped an all-time record of 21.1 million tons of steel to our shores. And our nation's trade deficit in steel was more than $5½ *billion!*

But the worst is yet to come. By 1985, unless we soon start expanding our domestic steelmaking capacity, 25 to 30 million tons of steel imports could be entering the U.S. market annually. That would mean an outflow of $12 to $15 *billion* a year—and a huge increase in our steel trade deficit.

What's needed to *reduce* America's trade deficit in steel? Governmental policies that will allow the American steel industry to generate the additional funds needed to modernize and expand.

**Bethlehem**

Bethlehem Steel Corporation, Bethlehem, PA 18016

F. H. Cushing, anthropologist-extraordinary, wore Indian garb, an officer wrote, "to out-Zuñi the Zuñis."

*By John Sherwood*

# *Life with Cushing: farewell to desks*

*Boy wonder of the Smithsonian's old Bureau of Ethnology, he lived among the Zuñi and gave new dimensions to American science*

He appears in kachina costume, left, and as a Dakota warrior, above, when he was much older.

It was a small government bureau, but an elite one with an epic cast of tireless, legendary heroes and heroines. Their goals were impossible because they came too late and with too little. But what they lacked in numbers and funds they more than made up in determination as they documented dozens of supposedly dying American Indian cultures at a time when the "external" problem of the Indian had become an "internal" one.

The Smithsonian's Bureau of American Ethnology was founded 100 years ago and was led by Major John Wesley Powell, the one-armed Civil War hero who explored the Grand Canyon in a wild, 100-day, 1,000-mile adventure (SMITHSONIAN, May 1974). One of the most flamboyant members of his staff was Frank Hamilton Cushing (above), the first professional anthropologist to live extensively with Indians.

Even Cushing's colleagues in an institution famous

for its eccentrics puzzled over the methods of his particular madness. An enigmatic, uncontrollable spirit, he was a publicity hunter, a chronic complainer, always in debt, but tolerated as the "boy genius" of the Smithsonian. He became known as the "White Indian" because of his total immersion in the Indian way of life, and even attended Washington meetings dressed like an Indian, a quiver of arrows over his shoulder.

Cushing weighed one and a half pounds at birth and spent his first 18 months as a "cushion baby," carried about on a pillow. His physician-father, a free-thinker, gave up medicine to study philosophy and taught his children to call him "Cushing," not "Papa" or "Father." He also forbade "inferior" phrases such as "please," "thank you," "I beg your pardon," and so on.

Sporadically educated, young Cushing was fascinated with nature and would take to the deep woods, "talking" to the creatures of the forest with whom he felt a spiritual affinity. As with many future anthropologists, an arrowhead got him hooked: "When I was a boy less than 10," he wrote, "my father's man, while plowing one day, picked up and threw to me across the furrows a little blue flint arrow-point, saying, 'The Indians made that. . . .' I took it up fearfully, wonderingly. . . . It was small, cold, shining and sharp —perfect in shape. Nothing had ever aroused my interest so much."

Frank began exploring the woods around his boyhood home in Medina, New York. Now he had a purpose. He would search for Indian sites. He would pretend that *he* was an Indian. He developed an uncanny talent for finding ancient sites, and he would dress in Indian garb, build a birchbark "wigwam laboratory" and stay alone for days.

Educating himself, he became aware of the work of one of the first students of the American Indian, Lewis Henry Morgan, a sometime New York lawyer who wrote *The League of the Iroquois*. Encouraged to write to the Smithsonian about his finds in Orleans County, the 17-year-old sent off a paper which, to his utter amazement, was published in the Smithsonian annual report of 1874.

Cushing continued corresponding with

*John Sherwood is on leave from the* Washington Star, *and plans a book about scholars of the Smithsonian.*

Cushing, just after his 22nd birthday—six days later, he was off to Zuñi.

the Smithsonian and also began pressing for a position. Assistant Secretary Spencer F. Baird sent him publications, but no job offer. Cushing went off to Cornell, where he spent most of his time reading only what he wanted to in the library. When Baird came through with an offer in November of 1875, Cushing quit Cornell and left for the Smithsonian castle, where he was given a free room in one of the towers. He was 18 and couldn't believe his luck.

Biding his time with curatorial and local fieldwork, the newly named Curator of Ethnology became interested in the Indians of the Southwest and longed for a job in the field, where fame and adventure were waiting.

Word of such a magic assignment came late on a hot summer day in 1879 when Baird, now Secretary of the Institution, summoned him to his office. "Haven't I heard you say you would like to go to New Mexico to study the cliffhouses and Pueblo Indians?"

"Yes, sir," said Cushing.

"Very well then, be ready to accompany Colonel [James] Stevenson's collecting party, as ethnologist, within four days. I want you to find out all you can about some typical tribe of Pueblo Indians. Make your own choice of field, and use your own methods; only, get the information. You will probably be gone three months. Write me frequently. . . . Good-day." It is not recorded if Cushing skipped out, clicking his heels in delight. He reported to Major Powell (p. 106), head of the new Bureau of Ethnology (as it was first called) and supervisor of the Stevenson expedition.

For his study, Cushing chose the Zuñi, a highly complex, tightly knit community of isolated farmers and sheepherders in western New Mexico who had evolved a rich mythology and a ceremonial life never studied by the white man.

The Stevenson party set out from Las Vegas, New Mexico, in August of 1879. So anxious was Cushing to get there that he went on ahead of the expedition, riding his lazy little mule. In the midst of the "waterless wilderness," he discovered that he was "nearer the close of my long journey than I had dreamed." Standing on a height, he studied a far-off terrace. "I did not realize that this hill, so strange and picturesque, was a city of the habitations of men, until I saw, on the topmost terrace, little specks of black and red moving against the sky. . . . I hastened on with all the speed I could scourge out of my obstinate, kicking mule . . . nearer and nearer to the strange structures."

*First glimpse of Zuñi dance*

Arriving at the pueblo unnoticed, he found hundreds of congregated Indians, "gazing so intently down into one of the plazas beyond that none of them observed my approach."

He climbed several ladders leading to a housetop. "The regular *thud, thud* of rattles and drum, the cadence of rude music which sounded more like the soughing of a storm wind amid the forest of a mountain than the accompaniment of a dance, urged me forward, until I was suddenly confronted by forty or fifty of the men, who came rushing toward me with excited discussion and gesticulation . . . motioning me away."

It was Cushing's first sight of a ceremonial Zuñi dance, his first day in a village where he was to remain for nearly four and a half years, returning East only once. WJ "No Periods" McGee, a fellow anthropologist who was to donate his brain to the Smithsonian (it's still there), later said of Cushing: "The innate sympathy with simple life acquired in his boyhood soon brought him into intimate relations with the living tribesmen, and the bond became so strong . . . he decided

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Ceremonial dancers fill the plaza of Zuñi pueblo—a scene Cushing often noted.

to remain. . . . After mastering the language he acquainted himself with the Zuñi arts and industries; he was adopted into the ancient Macaw clan and the sacred name 'Medicine-flower' [Ténatsali], borne by only one person in a lifetime, was given him; then he was initiated into tribal fraternities and gradually inducted into the religious ceremonies and mysteries; and long before he left the pueblo he was second chief of the tribe, the Head Priest of the Bow, and lived in the family of the governor, wearing native costume, eating native food, and participating in all native occupations and pastimes. Such was Cushing's college course in ethnology."

The course was by no means without risk. At first camping outside the pueblo in a tent, Cushing wandered around observing and taking notes. The elders objected vehemently when he did this at religious ceremonies, but Cushing kept on. To make his work easier, he moved uninvited into the house of the Governor of the tribe, Chief Palowahtiwa, seeking

Ruins at right are of old Spanish mission. Coronado conquered the Zuñi in 1540.

to develop the most powerful ally he could find.

"I moved books, papers and blankets to the governor's house," Cushing wrote. "On the dirt floor in one corner I spread the blankets, and to the rafters slung a hammock. When the old chief came in that evening and saw that I had made myself at home, he shrugged his shoulders.

" 'How long will it be before you go back to Washington?' he attempted to ask.

" 'Two months,' I signified.

" '*Tuh!*' (damn) was his only exclamation as he climbed to the roof and disappeared through the sky-hole."

The Governor threw out Cushing's "pig grease" (bacon), and fed him his first real Zuñi meal: boiled mutton and corn cakes mixed with beef and chili. Cushing found the native food loathsome, especially when the Governor's wife continually dropped it on the floor, stepped on it with dirty moccasins, then served it. Cushing always had a bad stomach anyway.

Watched constantly, day and night, Cushing continued with his incessant

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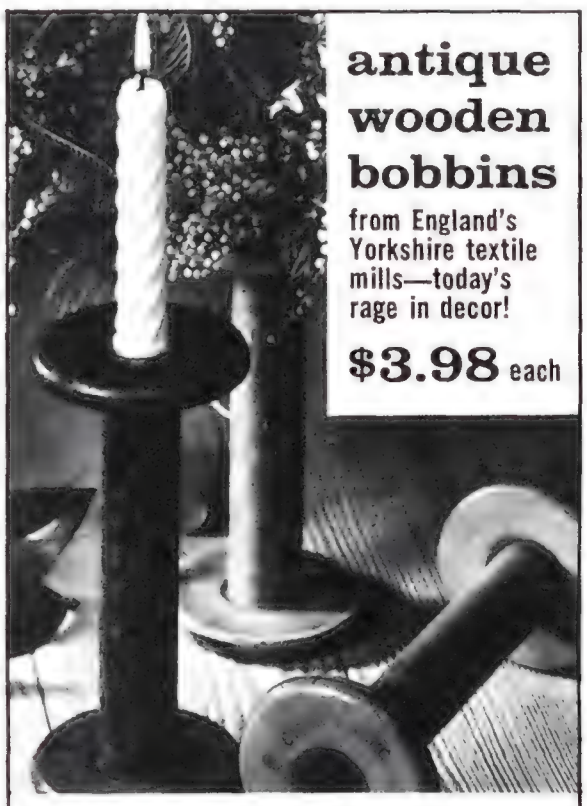

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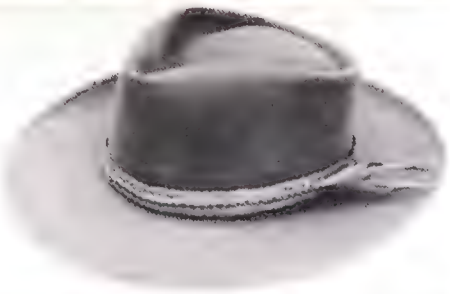
Cushing fashions a pottery jar, showing his amazing talent at Zuñi handcrafts.

observations and note-taking, infuriating some of the Indians. But many were growing to like this spunky white man who was so sincerely interested in their way of life. Living apart from the Stevenson camp, he began to learn the language, although the "inner life" of the Indians was still hidden from him.

One time the Governor told Cushing to stay away from a sacred dance coming up the next day, saying he could not see it. "*I* think I *shall*!" Cushing replied. On the day of the dance, he was told to leave his pencil and notebooks behind. "If you put the shadows of the great dance down on the leaves of your books to-day, we shall cut them to pieces," the elders threatened, seizing his books. Cushing snatched them back, pulled his long hunting knife and warned them that whatever hand gripped his arm would be cut off, that whoever cut his book to pieces would only cut himself to pieces. The bluff worked.

Later, on the eve of another sacred dance that no white man had ever seen, a secret council was held. The Indians suggested that the "Cushing problem" be solved by simply condemning him for sorcery and executing him. But the "Knife Dance" went on as scheduled, and Cushing was there with his trusty pencil.

Wearing masks "smeared with blood," the dancers carried "huge, leaf-shaped, blood-stained knives of stone, which . . . they brandished wildly in the air . . . often pointing them toward [the intruder]." Then two men, "naked painted

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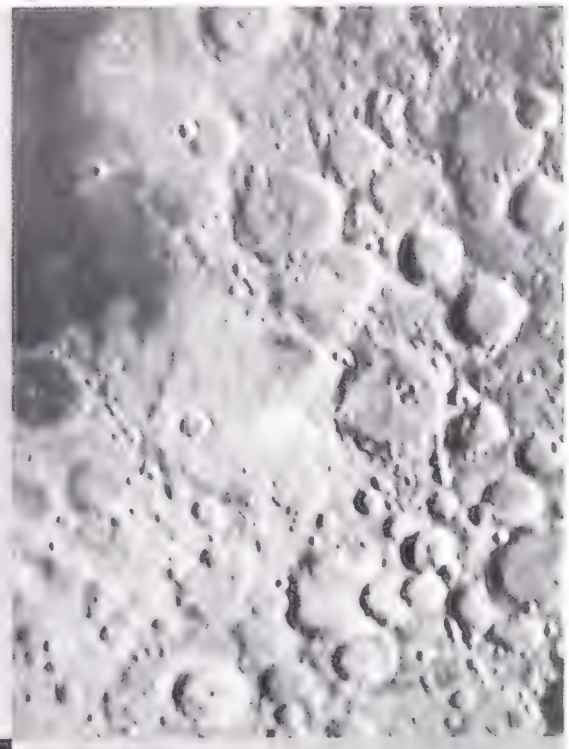

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Pueblo complex became new home to Cushing. Alone, provisionless, he forced

devils" with a "most ghastly and ferocious appearance," began threatening Cushing with their clubs. They rushed to the ladder on which he was perched. "Kill him!" they screamed. One of the dancers began hitting the rungs with a war club and climbing toward him.

Cushing drew his knife again, flashed it in the sunlight and bravely stood his ground. The Zuñi had planned to excuse the killing on the grounds that he was taking the place of a Navajo—the ancient enemy of the Pueblo Indians. But someone shouted: "We have been mistaken. This is no Navajo," and the two men withdrew.

Cushing calmly continued with his notes while the entire tribe fell silent, all eyes upon him. Then suddenly, the assemblage applauded, and "some of the old men even came up and patted me on the head, or breathed on my hands."

The Stevenson party left Cushing in late 1879 with little warning. Feeling like a "doomed exile," the young man checked with a missionary for promised provisions. There was nothing. With "gloomy forebodings," he returned to the pueblo. Back in his lonely room, he buried his face in his hands. Asked why he was so sad, he told the Governor: "Alas! My friends are all gone, and they have left me nothing."

This was a turning point. "Little brother," said the Governor, "you may be a Washington man, but it seems you are very poor. Now, if you do as we tell you, and will only make up your mind to be a Zuñi, you shall be rich, for you shall have fathers and mothers, brothers and sisters,

s way in, joining the community,
lopting its whole and unique culture.

Governor, Cushing's unwilling host,
said "damn!" when Cushing stayed.

and the best food in the world. But if you do not do as we tell you, you will be very, very, very poor indeed."

Then the Governor decided that the time had come to get him out of his "rabbit net" (hammock), his "mouse-head-shaped hat," and replace his "squeaking foot-packs" with red buckskin moccasins. At first Cushing was "heartily ashamed of [this] mongrel costume," and shocked to find his civilized clothes thrown out.

" 'Here,' said Chief Pa-lo-wah-ti-wa [above], 'take these two blankets,—they are all you can have. If you get cold, take off all your clothes and sleep next to the sheepskins, and *think* you are warm, as the Zuñi does. You must sleep in the cold

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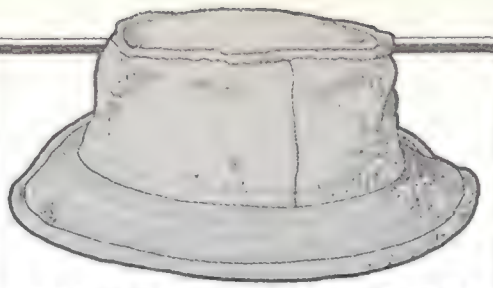

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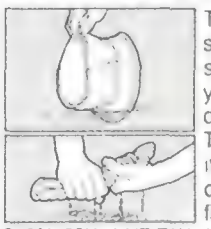

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and on a hard bed; that will harden your meat. And you must never go to Dust-eye's house [the Mission], or to Blackbeard's [the trader's] to eat; for I want to make a Zuñi of you.'"

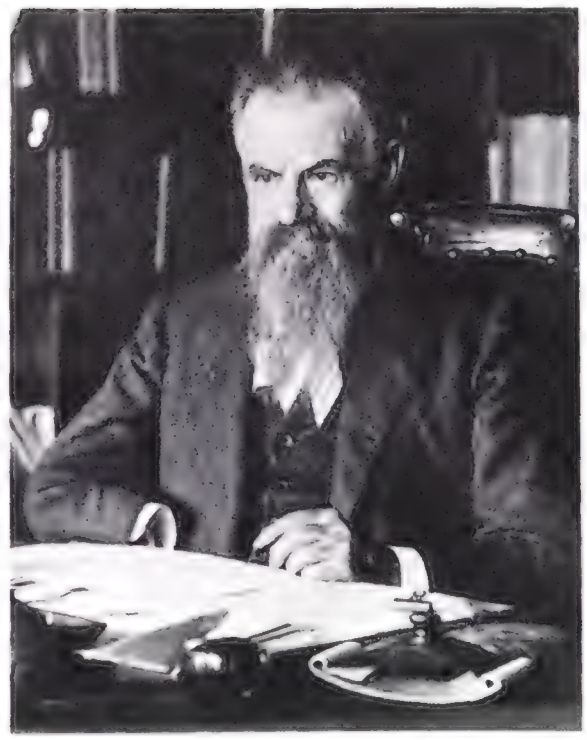
Later that same year, after being told about ancient Indian jade and turquoise mines 50 miles away in the Zuñi Mountains, Cushing set out to find them. It was snowing when he left with a prospector and a wanderer who were going that way. They were raided by a band of Navajos and had few supplies left when they reached their goal.

*Secretary Baird gets farewell note*

Returning, they got lost in a blizzard and stumbled onto the hut of a young prospector. At sunset, Cushing's companions hurriedly left, and during the night his mule broke away. Not sure he would make it back on foot, he penned a "farewell" note to Baird and left it with the prospector in case he didn't return in two weeks to pick up his collection.

The letter is on file at the Smithsonian Archives. Headed "Cañon del Cobre, Zuñi Mountains, New Mexico, December 3, 1879," it relates his predicament: "This morning I shall track [the mule] if possible; if not, I shall strike off over the mountains for Zuñi, where he has probably gone. In this altitude, among strange mountains, and with scant provisions, the chances are about equal that I get caught by a snowstorm and freeze, get lost and starve, or reach my destination in safety. . . . Therefore, should this reach you, you may conclude that I have perished and I would suggest, as the easiest way of informing all my friends and relatives—that a paragraph be put in the press to that effect. . . ."

Lost in the intense cold and overtaken by blizzards, he luckily happened upon an Indian ranch after two days of wandering in the wilderness. After finally reaching Zuñi, he returned to the hut to pick up his "precious specimens." He was again set back by one snowstorm after another, but finally dragged himself into Fort Wingate on horseback. He immediately wrote Baird a note and enclosed the "farewell" letter. Going to the post surgeon for medical treatment for overexposure, Cushing was refused aid and told, instead, to take off his Indian clothes and dress "like a civilized human being." He wrote Baird: "I had rather faced the



John Wesley Powell, Cushing's boss, later admitted he "loved him as a son."

storms of the highest peaks . . . than the contempt I have this day faced. The one chills only the body and freezes the skin, but the other chills all faith in humanity and freezes the heart."

It was here at Fort Wingate that Boston journalist Sylvester Baxter first spotted the pale and emaciated-looking white man: "We saw a striking figure walking across a parade ground . . . a slender young man in picturesque costume; a high-crowned and broad-brimmed felt hat above long blond hair and prominent features; face, figure, and general aspect looked as if he might have stepped out of the frame of a cavalier's portrait at the time of King Charles."

Later, Cushing had his ears pierced in a special ceremony, and was given the name of Medicine Flower, in recognition of some of the simple remedies he had brought with him. After this, he came to immerse himself "in the mysterious life by which I had little dreamed I was surrounded. . . ." He was admitted to more and more secret ceremonies, waking up before sunrise and not sleeping until after midnight, when his notes were finally completed.

He endured physical punishment and fasting, as well as going without sleep. He danced throughout the night until exhausted. He maintained long periods of motionless silence. He watched as boys swallowed flaming torches and were scourged with cactus spines. He was on

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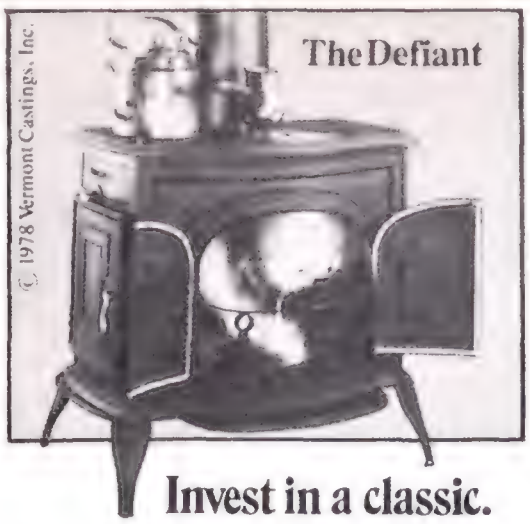


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his way to being counted as one of the "Children of the Sun."

It took him two years to become a member of the martial, first-class society of the Priests of the Bow, "at once the most powerful and the most perfectly organized" of all the 13 Zuñi orders. Cushing describes a ceremony in colorful detail: "What a wonderful night it was! The blazes of the splinter-lit fire on the stone altar, sometimes licking the very ladder-poles in their flight upward through the sky-hole,—which served at once as doorway, chimney, and window; the painted tablets in one end, with priests and musicians grouped around; the spectators opposite and along the sides; the thin, upward streams of blue smoke from hundreds of cigarettes; the shrill calls of the rapidly coming and departing dancers, their wild songs, and the din of the great drum, which fairly jarred the ancient, smoke-blackened rafters; the less distinguishable but terribly thrilling 'swirr-r' of the yucca-whips, when brought down on some luckless sleeper's head and shoulders; the odors of the burning sacrifices, the tobacco, and of evergreen. All this was impressed indelibly on my memory, —the more impressive, that I was the first of my race to witness it."

(Such reports led John Wesley Powell to say later, "He can think as myth-makers think, he can speak as prophets speak, he can expound as priests expound, and his tales have the verisimilitude of ancient lore.")

*Health and finances deteriorate*

Baird and Powell sent him shell and turquoise for use as trade goods, extremely important items in Cushing's harrowing existence. He was seriously ill, a great deal of the time with pulmonary problems, and confined to bed for long periods. His correspondence was becoming voluminous. He was in desperate need of more money and supplies. He asked that books be charged to his account and sent to him, saying the Smithsonian could keep them in case of his death.

He saw ahead of him "nothing but the most constant work . . . for at least four more years to make my work *exhaustive*." But he wanted to cut it down to a year or two because "I have interests in life apart from Zuñi." He also wanted to bring some Indians East "as [they] have for each day, more than a year, spoken of

Philadelphia Museum of Art

Cushing's wife, Emily, went to Zuñi, too, but not without her sister and a cook.

this, begging that I should bring it to pass." He strung out a piece of bait, irresistible to a fanatical collector like Baird: "They promise to furnish me a series of their . . . costumes for the dances, etc., than which nothing can be more interesting, beautiful or valuable for an ethnographic museum."

And, oh yes, there was one more catch: he had been given an ultimatum of either marrying a Zuñi girl or making the grand tour East. Cushing preferred the tour, he pointed out. And, wonder of wonders, it was on! The party, including of course the Governor, four more Zuñi headmen-priests and one adopted Hopi rainmaker, left the pueblo in February 1882 (p. 110).

The Indians had never fully believed Cushing's descriptions of the "wonders" back East. They had a knowledge of the Atlantic ("the Waters of the World of Day") from time immemorial through their prayers and myths that also told of the "Ocean of Hot Water" (the Gulf of Mexico), the "Ocean of Sunset" and, further, the "Ocean of the Place of Everlasting Snow."

But in Chicago they saw the "strange and unknown people" who "eat food with fingers and knives of metal" and began to think of Cushing as the Godlike spirit of

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Indian headmen-priests journeyed East with Cushing and met the President.

Zuñi Governor sits at front right; Hopi rainmaker stands in back row, center.

an ancient ancestor come back to meet them. Traveling there by train "without their feet having touched the earth," they became quite excited in a park when they spotted two sea lions. Considering them "animal gods of the ocean," they prayed fervently: "At last, after long waiting, we greet ye, O our fathers!"

The Indians met President Arthur in Washington, then went on to Boston ("City of Perpetual Mists"), marveled at Wellesley College and sang and danced at Harvard. They also saw a minstrel show and thought it a mysterious rite of some white American secret order. They repeatedly stretched out their arms to draw in the spirit of the "holy men" on stage. But the highlight of the trip came when they filled containers with sacred water from the sea to take back to Zuñi and use in future ceremonies (pp. 112-113).

While the party was still in the East, Cushing married the daughter of a Washington banker (p. 108). The Indians apparently liked her so much that the Governor warned Cushing he must not return to Zuñi without her. She left a fine home to go live with her new husband in an Indian pueblo, but this time it was Cushing's own house and his life was to be quite different, for he had brought along not only his wife's sister, but a cook, "a maid of all work."

After Cushing's return to Zuñi, he began to get involved in minor scrapes. He was in a Zuñi raiding party that shot some Navajo horses trespassing on "our territory," calling himself the "First War Chief of the Zuñis." By this time he considered the Zuñi culture "his" property and resented anyone else's studying it. He also got tangled up in a land-grabbing scheme, successfully fighting off a claim involving the powerful Senator John A. Logan of Illinois, who threatened to destroy the Bureau of American Ethnology (BAE) if something wasn't done about Cushing. Eventually, Major Powell, fearing for Cushing's worsening health, recalled him in 1884.

To make some money, Cushing wrote his classic, 19-part series of "Zuñi Breadstuff" for an Indianapolis grain-trade journal, *The Millstone*. It was brilliant, but it wasn't for the BAE. Powell wanted reports, but Cushing began to take long sick leaves and extended vacations, looking for a way to get back into the field.

He organized an archaeological expedition in the Southwest financed by a wealthy Boston philanthropist, Mrs. Mary Hemenway, but found himself unable to hold together the large expedition. He made premature announcements of findings to the press. There were hints of his faking a specimen. His health collapsed. But in the early 1890s he recovered and returned to scholarly writing.

Learning of some unusual discoveries on Marco Island, he wangled yet an-

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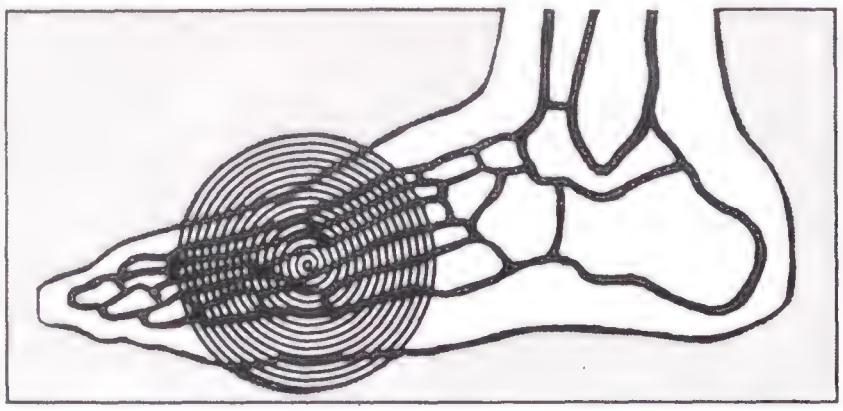

It was the European trip I had always dreamed about. I had the time and money to go where I wanted—see what I wanted. But I soon learned that money and time don't mean much when your feet hurt too much to walk. After a few days of sightseeing my feet were killing me.

Oh, I tried to keep going. In Paris I limped through Notre Dame and along the Champs-Elysées. And I went up in the Eiffel Tower although I can't honestly say I remember the view. My feet were so tired and sore my whole body ached. While everbody else was having a great time, I was in my hotel room. I didn't even feel like sitting in a sidewalk cafe.

The whole trip was like that until I got to Hamburg, Germany. There, by accident, I happened to hear about an *exciting breakthrough for anyone who suffers from sore, aching feet and legs.*

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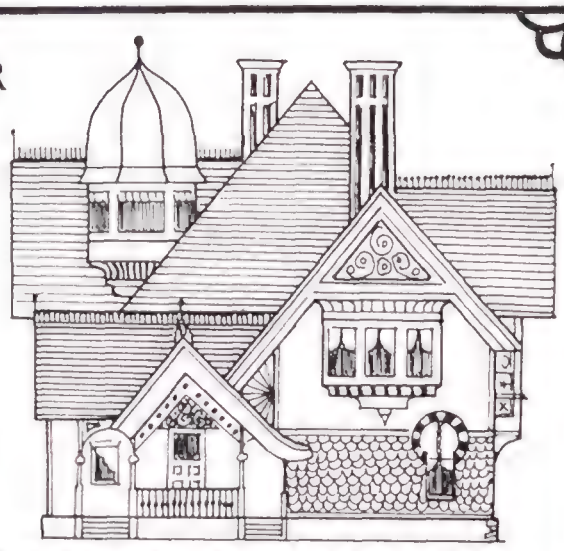

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other leave from Powell. Financed by a second wealthy woman, Mrs. Phoebe Apperson Hearst (the mother of William Randolph Hearst), he arrived in February 1896 to work in the "foul-smelling muck and peat beds of [Key] Marco." He came up with some astonishing objects of a type that had not been found earlier in Florida and have rarely been found since.

He again jumped the gun by making claims that turned out to be false. But worse than that, he fabricated a painted shell and passed it off as authentic.

Struggling to write a report on his Florida work, he went to Maine to rest and there got interested in shell heaps. Powell, fully aware of Cushing's uncanny instincts for finding ancient sites, came up and was enthusiastic. But Cushing's stomach pains were becoming so severe that they now caused him to faint. His health was deteriorating rapidly. On April 10, 1900, back in his house in Washington and planning a summer expedition with his wife over dinner, Cushing choked on a fish bone, began hemorrhaging and died before help could be summoned. He was not yet 43.

In an unpublished PhD dissertation on Cushing for the Univerity of Arizona in 1965, Raymond Stewart Brandes, the first to chronicle that remarkable, short-lived

Artist shows Indians scattering sacred meal at Deer Island, in Boston Harbor.

career, writes that Cushing "blazed more trails in American ethnology and archaeology than any other man."

"Cushing, of course, romanticized Zuñi life," says William C. Sturtevant, current Curator of North American Ethnology at the Smithsonian. "He heightened the difficulties and dangers he underwent in adjusting to it, and exaggerated the degree to which he was accepted as a Zuñi. But remember, he was writing for a prejudiced audience. He really did come to understand the Zuñi better than any outsider had before.

"His importance as an anthropologist goes beyond that. For the historian Joan Mark has demonstrated that to him we owe our concept of cultures (in the plural)—our understanding that each society has its own unique and integrated ways of life. The older notion of culture (singular) assumed that all societies, at a similar 'stage' of development, had more or less similar ways of life. Cushing immersed himself in Zuñi culture and had the sharp intelligence to see it was a quite different whole from any other. His insight was immediately adopted by other anthropologists and eventually by the public. It was one of those discoveries that are so obviously right as to be quickly accepted and its origins as quickly forgotten."

Here they scooped up water to carry back to New Mexico (inset).

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# *Book reviews*

*Telling Lives: The Biographer's Art*
Edited by Marc Pachter
(New Republic Books/National Portrait Gallery, $9.95)

*Telling Lives,* a slim collection of essays on the art of biography, is very much like a gallery of self-portraits. Seven writers—Leon Edel, Justin Kaplan, Alfred Kazin, Doris Kearns, Theodore Rosengarten, Barbara Tuchman and Geoffrey Wolff—step back from their work and cast a critical eye upon themselves and the art of telling lives. The result is instructive and intellectually adventuresome.

It is no accident that this collection had its origin in a symposium on biography held at the National Portrait Gallery. These writers, both at the symposium and in their essays, repeatedly compare their craft to that of the portrait painter or sculptor. Appropriately the analogy is sanctioned by history, dating back to Plutarch, "as near a patron saint as biographers have," and in more recent times to Lytton Strachey, the father of modern biography.

Consisting of distinct verbal sketches, *Telling Lives* is not a finished treatise but a series of individual musings and conjectures. "The Figure Under the Carpet," the lead essay by Leon Edel, the Pulitzer Prizewinning biographer of Henry James, is the most masterly and comprehensive piece in the collection. The other essayists in one way or another enlarge upon ideas or concerns Edel has already broached in his many works.

Like the portrait painter, according to Edel, the biographer must venture beyond the surface, must penetrate appearances to attain the hidden inner myth—"what people are really saying behind the faces they put on, behind the utterances they allow themselves to make before the world"—what Justin Kaplan, who is soon to publish a biography of Walt Whitman, calls "the naked self."

Unlike the portrait painter, however, the modern biographer, confronted by the mountainlike clutter of material, must distill and arrange his facts into an esthetic whole. He is seeking to fashion "a man or a woman out of the seemingly intractable materials of archives, diaries, documents, dreams, a glimpse, a series of memories." Not to do so, Edel warns, is an "ingenuous way of avoiding biographical responsibility."

The difficulties of cutting clean through the multifarious facts, which often screen rather than reveal, and of glimpsing the inner man or woman, become even more challenging when the biographer is on intimate terms with his or her subject. Doris Kearns, author of *Lyndon Johnson and the American Dream,* addresses the difficulties inherent in capturing the "whole man" when the man (in her case, Lyndon B. Johnson) tells but, in the telling, distorts his own story. Theodore Rosengarten, winner of the National Book Award, discusses the special problems of oral history, the chief source of which is personal testimony preserved by tape recorder.

When one tells his own life, the aim is still to capture the "whole sense of a person," but, as literary critic Alfred Kazin reflects, the autobiographer, unlike the biographer, pursues his own story in "an effort to find salvation, to make one's own experience come out right." In another vein, Barbara Tuchman shifts the book's focus. She speaks as a historian who employs biography as "a vehicle for exhibiting an age," as a prism through which to present the universal in the particular.

It is of crucial importance now, in the age of the massive two- and three-volume biography, to reflect on the nature of "the art of human portrayal in words." Unfortunately, no modern critics, Edel says, "have chosen to deal with biography as one deals with poetry or the novel." Instead critics expatiate about how the life was lived, rather than about how it was recorded. *Telling Lives* is a first step toward a long-delayed *Ars Biographica.*
*—Paul Piazza*
Author, *Christopher Isherwood: Myth and Anti-Myth*

*Victoria Ocampo: Against the Wind and the Tide*
Doris Meyer
(George Braziller, $15)

A fairy tale for our time: a beautiful and brilliant girl child is born into a prominent, wealthy South American family at the end of the 19th century. She is raised in loving but restrictive Victorian circumstances, is surrounded by luxury, is educated royally, enjoys an idyllic childhood (part of it spent in Europe), falls in love, is unhappily married, stays with her husband to keep up appearances, finally breaks away and carves out a life of her own—one filled with so many events and achievements that it could make several ordinary lifetimes. She meets and befriends literary, artistic and intellectual figures from all over the world, founds an influential magazine and a publishing house which help put her country on the cultural map, becomes famous in her own right, is put in prison for her convictions, is the first woman elected to the Argentinian Academy of Letters, and is ultimately acknowledged as one of the most important women in Latin America.

All of which, of course, is a true story, that of *"la superbe Argentine"* (as Malraux called her), Victoria Ocampo. She died on January 27 of this year, "still a rebel" at the age of 88, according to Doris Meyer's new biography. The book provides a welcome introduction to the life and work of an exceptional woman. It also includes a selection of Ocampo's essays, translated into English for the first time, and a collection of photographs of this exquisitely lovely woman. Meyer does a good job, too, of establishing an ambience for Ocampo: interwoven with the biographical materials is a solid overview of Argentinian history and culture, and a sensitive treatment of the high society into which Ocampo was born and which, much as did our own Edith Wharton, she both had to live with and escape.

Ocampo herself stands out as a woman for whom people and personal experience meant everything—it was through them that she approached literature, the arts and ideas. Her friendships were legion and fed from a deep well of emotions. She was close to or knew such people as Ortega y Gasset, Virginia Woolf, Waldo Frank, Adrienne Monnier, Albert Camus, Paul Valéry and Maurice Ravel. In Latin America she worked with people like

Jorge Luis Borges, Eduardo González Lanuza and Gabriela Mistral. *Sur,* her literary review devoted to introducing new writers, nurturing creative excellence and establishing cultural dialogues between the continents, became South America's leading literary magazine. The hospitality extended in her house—a Corbusierlike structure built defiantly amidst the Victorian mansions and *belle époque* villas of upperclass Buenos Aires—was continuous.

As a rich woman Ocampo could sell a diamond tiara to pay the rent for the visiting Indian poet Rabindranath Tagore, but she was also a person of simpler gestures, and one willing to defend her principles and bravely survive. In 1953 she spent several weeks in a Peronist prison and treated the whole thing as a learning experience. Her enthusiasms sometimes got her into trouble, her quick temper and stubborn pride occasionally caused long-lasting estrangements, but on the whole she was wonderfully successful at turning her heroes into friends.

Victoria in Paris, 1913

Doris Meyer seems to share this trait, for she first studied Ocampo as the subject of her undergraduate honors thesis (she is now Associate Professor of Spanish at Brooklyn College, CUNY), met her and eventually went to stay with her in Argentina, where she was given access to thousands of letters and other materials for her biography. The book is informative and avowedly "personal"—not highly analytical, except where Ocampo herself is quoted, and, although refreshingly straightforward, it sometimes belabors its points. Ocampo believed that each person possessed an inborn, predestined and unique character, and along with a strongly mystical streak and a reverence for the role of memory, this belief informs the essays culled from her more than ten volumes of prose (she also wrote a dozen shorter works). Although the selection is too slight for a final assessment of her literary stature, the clarity and humanity of the essays are a delight.

Above all, Meyer's biography reveals a person made up of and surrounded by dichotomies all her life and it indicates how they were resolved: America and Europe were brought together in the pages of *Sur;* romantic love and the passion for knowledge existed side by side; the refusal to mix literature and politics bolstered a career dedicated to making choices based on an "elite" aristocracy of the intellect and creative accomplishment.

The most significant duality was Ocampo herself: both muse and creator, inspirer and inspired, feminine archetype and fighter for the rights of women, the idea of their liberation as a "revolution" for "Cinderellas of culture" everywhere. Her legend and its very real underpinnings live on in Meyer's book.

*—Celia Betsky*
Fellow, the Smithsonian Institution
and the American Association
of University Women

*Bat Masterson: The Man and the Legend*
Robert K. DeArment
(The University of Oklahoma Press, $14.95)

Biographies of Western gunslingers, as a genre, must rank a few notches below political campaign biographies and the true confessions of aging stripteasers. The genre originated in the "sketches" dis-


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patched from the Wild West to Eastern newspapers and magazines in the decades after the Civil War. Wild Bill Hickok, for example, was established as a romantic hero by *Harper's New Monthly Magazine* in 1867, while Bat Masterson's reputation was made by a reporter for the *New York Sun* in 1881.

The *Sun* sketch introduced New Yorkers to a man "who has killed twenty-six men, and he is only twenty-seven years of age. He is W. B. Masterson, of Dodge City, Kansas. He killed his men in the interest of law and order." The image of a deadly gunslinger stayed with Masterson the rest of his life, although there is no evidence that he ever shot and killed anyone in his years as a buffalo hunter, cow-town lawman, county sheriff, gambler and hired gun for the Santa Fe Railroad in its war with the rival Denver & Rio Grande.

Bat Masterson, all dressed up

The notion that Bat had shot a man for each year of his life was widely circulated in the West, where it was generally considered good advertising by the towns and gambling houses that hired him, but no one took it very seriously. One Kansas newspaper mildly protested that such exaggeration "has a tendency to bring Kansas statistics into disrepute, and also to discourage some humble beginner in the field of slaughter who has as yet sent only four or five to act as foundations for the daisies."

By the turn of the century, however, book publishers had discovered a rich market for such romantic gore and, as the Wild West was ground into pulp fiction, biography became an extension of the Western dime novel by other means. The first book about Bat Masterson's life, *The Sunset Trail*, was in fact published in 1905 as fiction. Biographers have been perpetuating the fiction as fact ever since.

Robert K. DeArment's *Bat Masterson* is, its publishers claim, "the most reliable biography of Bat to date." Although that is not claiming very much, it may be more than a press as reputable as that of the University of Oklahoma ought to claim. DeArment, despite 20 years of research in libraries, museums and state and national archives, relies uncritically on sources even his own research discredits. He cites Wyatt Earp as an authority on Bat, for example, although what Wyatt says comes from a biography written by a *Saturday Evening Post* writer in 1931, in which Wyatt also claimed to have served as city marshal at Dodge City, Kansas, and Tombstone, Arizona. In fact, Wyatt Earp was never a city marshal anywhere, although he was a deputy at Dodge City and his brother Virgil was city marshal of Tombstone.

If DeArment has not written an entirely accurate book about Bat Masterson, he has almost managed to write a dull one. He has confused the scholar's task of sifting fact from fiction with the biographer's work of re-creating a life, and labors so long to dispose of his predecessors' biographies that the real Bat is hard to find in his own.

Bat Masterson lived a fascinating life, and he was part of a turbulent era of economic greed and violence which has left an imprint on our own society and times. There are glimpses of him in this book, as when he writes to Colt's Patent Fire-Arms Manufacturing Company from the Opera House Saloon in Dodge City on July 24, 1885:

"Gents

"Please send me one of your Nickle plated Short 45. [sic] Calibre revolvers. It is for my own use and for that reason I would like to have a little Extra pains taken with it. I am willing to pay Extra for Extra work. . . ."

At the end of his gunfighting career, Bat moved to New York City on a prize-fight promotion venture. Two weeks after he arrived he was arrested and charged with running a crooked card game in which the son of the president of the Mormon Church was bilked of $17,000. That charge was dropped, but Bat was fined $10 for carrying a concealed weapon, and his six-shooter was confiscated.

After his arrest, Bat told a reporter for the *New York World* what he thought of New York's finest: "This fellow Gargan who arrested me is a warm baby—in his mind. He thinks all people are suckers. That's the trouble with these mush-headed coppers. Give them a political job to keep them from starving and they think they own the earth. They get a shield on their vests, a pistol and a club and then they run amuck." Bat Masterson wasn't larger than life, but he deserves at least one good biographer.

*—Paul Trachtman*
Board of Editors, author of
*The Gunfighters*

*Gold Was the Mortar: The Economics of Cathedral Building*
Henry Kraus
(Routledge & Kegan Paul, $30)

Anyone who has ever tried to raise money for the PTA knows the problem: reaching the people. It was the same back in 1137, when citizens and clergy of Amiens were about to rebuild their church. For a start, they settled on the idea of parading the relics of their beloved first bishop, St. Firmin the Confessor, throughout the countryside. Carefully, his venerable bones were transported at the head of a solemn ecclesiastical and civil train. At the gate of the city, however, the saint's reliquary stopped. His ossified spirit simply refused to budge another step. It was a sign. And with great joy, the populace returned their relic to its accustomed place and began to donate whatever they could, then and there. Rings, coins, furs and necklaces tumbled in profusely. The result was a tradition of generosity that eventually made possible one of the world's great buildings. Over more than three centuries of construction and decoration, the Amiens cathedral received financial aid from many sources, including the Church hierarchy and clergy, the merchants of wine and Picardy dye and their trade associations, and finally the people themselves.

The ebb and flow of money from those people to their cathedrals is the subject of this valuable new study by Henry Kraus. In his last book, Kraus (along with his wife, Dorothy) gave us what is probably the definitive study of a minor medieval art, the misericords — those often-secular woodcarvings that grace the undersides of

choir-stall seats (SMITHSONIAN, April 1976). This time, Kraus has gone from alpha to omega, to give us a look at cathedrals, the most complex and ambitious art form ever devised. Shape, color, texture, design, sculpture, sunlight and physics all combine there in a way the world will be unlikely to reproduce again.

Cathedrals have been studied before. Their art and theology have been well dissected. But their financing has been largely ignored. The central question: how could any society come to support these financial albatrosses, which took from 75 to several hundred years to complete, but which eventually came to dominate the life as well as the skyline of Western Man?

To answer the question, Kraus profiles the economics of eight representative cathedrals—Notre-Dame de Paris, Amiens, Toulouse, Lyon, Strasbourg, York, Poitiers and Rouen, all built between the 11th and 15th centuries. His research is based on ecclesiastical records (most often on the so-called minster fabric rolls, and cartularies), civil wills (which were probated in church courts) and accounts written by contemporary chroniclers.

The findings are a delightful window on life in the late Middle Ages. For example, in the 12th century, when Gilles Alain was informed that the enlarged Church of St. Jacques de la Boucherie would abut his home, meaning that one wall would lose its windows, he bowed to the request—with the proviso that a slit the size of two fingers be left in the wall. Thereafter, Alain could assist at mass without ever leaving home.

Lengthy delays were common as countless activities competed for the money that could have speeded construction. The Crusades were a great drain on Paris. The strife between York and Canterbury to determine who should predominate in England led to even longer stoppages. Encouraged by Rome, each diocese incurred impossible debts seeking papal preferment. Construction lagged. In 1345, a child almost drowned in one of the pools that formed inside York Minster before the roof was completed.

Somehow the cathedrals managed to overcome the delays, the battles, the political acrimony. Kraus' research seems to show that it was not so much the Church hierarchy itself that was the steadying and civilizing element in medieval life as it was the force of plain and straightforward devotion. Again and again the populace is shown to contribute to a cathedral at the very times when they may have hated the clergy or a particular bishop. After all, a cathedral was not just a big church. It was the archbishop's seat, his *cathedra*, where decisions affecting the entire range of archdiocesan life were made.

By contrast, there were times when the hierarchy tried to freeze the burghers out of their cathedrals—in a misguided attempt at ecclesiastical separation and dignity. Whenever this happened, there would be a spate of chapel or hospice building. No doubt York's dignitaries had reasons for turning down Robert de Holme's bequest of £400. Still, the Minster could ill afford to lose those funds.

In Paris, participation of the bourgeoisie gave a unique individuality to the magnificient church and hospice of St. James of the Pilgrims. When it was completed, in the 14th century, it must have rivaled Notre-Dame itself. Unfortunately, only five statues remain from that church today. The cathedral we still have.

For the most part, however, individual contributions were encouraged. Thus, in St. Jacques de la Boucherie, Jacqueline-the-Dyer paid for a pillar. A man and wife paid for aisle vaulting, a burgher art lover, a portal. Whole families together might finance separate chapels within the cathedral proper. At Amiens, the sellers of woad (dye) from outlying towns built St. Nicholas Chapel, and the shoemakers of Paris must have funded a stained-glass window in Notre-Dame that featured their patron, St. Crispin.

Kraus makes good use of medieval wills to show the widespread participation of the laity. Reading those testaments today, you can fully understand the great privilege it was to leave one's earthly possessions to the greater glory of God. One William with the Long Nose instructs his executors to dig in his bin hopper, where long ago he had hidden 26 *livres* to go to one of God's buildings. Other bequests covered a wide range, including the case of a tailor who left two dozen arrows "plumed with peacock feathers," or another devout soul who left his razor and six cushions. But my favorite donor is the woman who took pains to remind her beneficiary that the property donated owed the local seignior "a rose in the time of roses." God must have been pleased.

*—Michael Olmert*
Writer and critic

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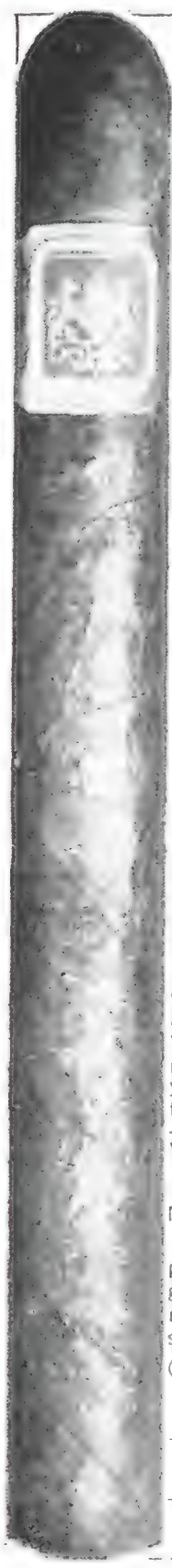

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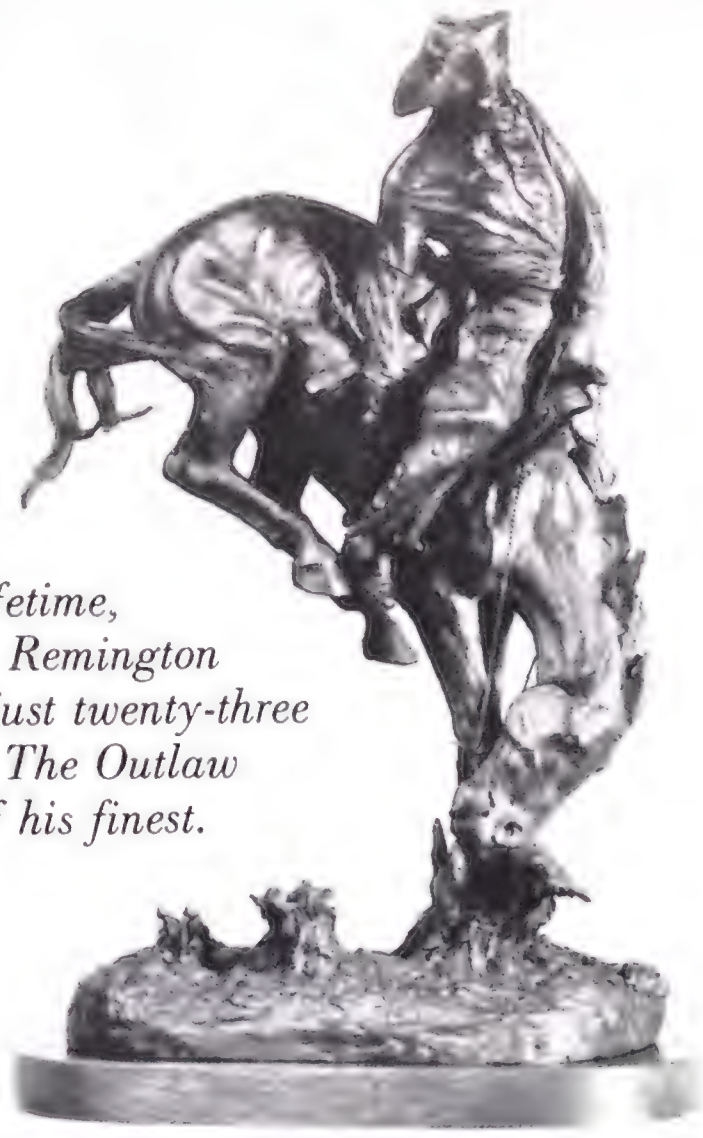

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# *Additional reading*


**Desert ecosystem** (p. 32)

"The Study of Aridity," special issue on the desert, *Mosaic*, January/February 1977

*The Desert* by Aldo Leopold and the Editors of Time-Life Books, 1961

*In the Deserts of This Earth* by Uwe George, Harcourt Brace Jovanovich, 1977

**National Institutes of Health** (p. 42)

*Heartbeat: The Politics of Health Research* by Natalie Davis Spingarn, Robert B. Luce, Inc. (Washington, New York), 1976

*Politics, Science and Dread Disease: A Short History of United States Medical Research Policy* by Stephen P. Strickland, Harvard University, 1972

*Inside the Cell* by Maya Pines, Department of Health, Education, and Welfare Publication No. (NIH) 78-1051

**Russian art** (p. 54)

*A Concise History of Russian Art* by Tamara Talbot Rice, Praeger, 1963

*The Horizon Book of the Arts of Russia*, edited by Thomas Froncek, American Heritage, 1970

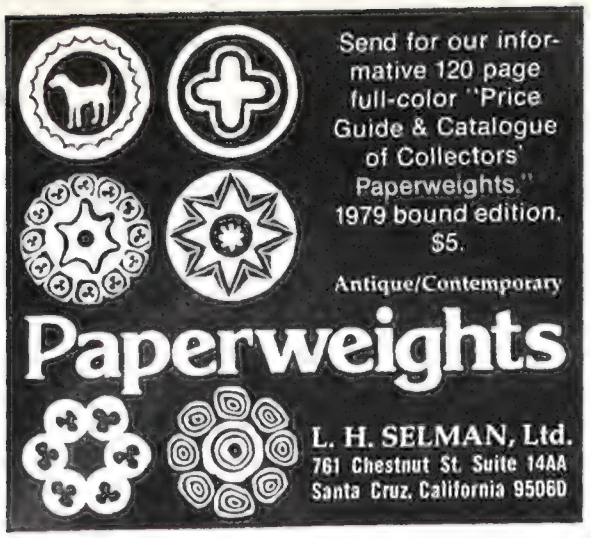
**Budapest** (p. 64)

*The Destruction of the European Jews* by Raul Hilberg, Octagon Books (New York), 1978

*Black Book on the Martyrdom of Hungarian Jewry* by Eugene Levai, Central European Times Publishing Co., Ltd. (Zurich), 1948

*Hungary* by Paul Ignotus, Ernest Benn Ltd. (London), 1972

*Out of the Ghetto* by Jacob Katz, Harvard University Press, 1973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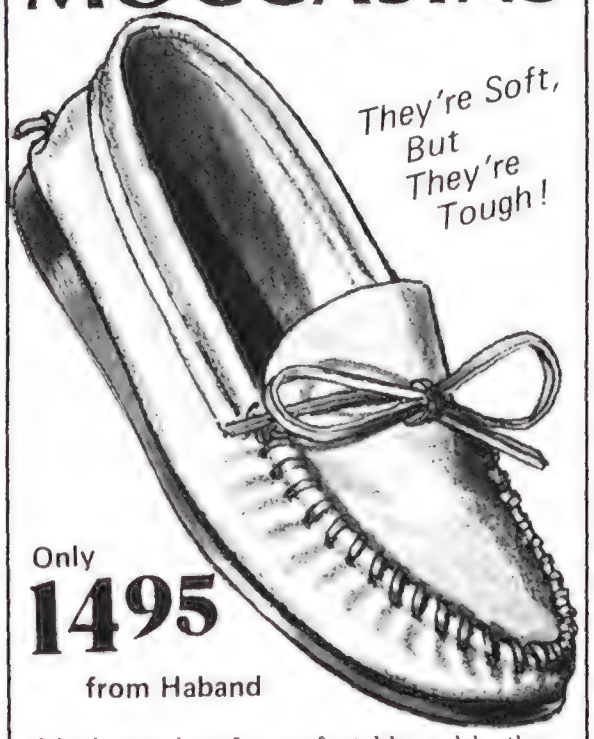


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**Thunderstorms** (p. 74)

*Golden Guide: Weather* by Paul E. Lehr, R. Will Burnett and Herbert S. Zim, Golden Press, 1975

*The Thunderstorm* by Louis Battan, New American Library, distributed by W. W. Norton, 1964

*Understanding Lightning* by Martin A. Uman, Bek Technical Publications (Carnegie, Pennsylvania), 1971

**Raccoons** (p. 83)

*The World of the Raccoon* by Leonard Lee Rue III, J. B. Lippincott Company, 1964

*Raccoons are the Brightest People* by Sterling North, E. P. Dutton & Co., Inc., 1966

*Raccoons and Eagles; Two Views of American Wildlife* by Polly Redford, E. P. Dutton & Co., Inc., 1965

"Who Can Resist a Raccoon?" by Bil Gilbert, *Reader's Digest*, May 1979

**Bladderworts** (p. 91)

*Carnivorous Plants of the United States and Canada* by Donald E. Schnell, John F. Blair (Winston-Salem, North Carolina), 1976

*The Carnivorous Plants* by Francis Ernest Lloyd, Dover, 1976

*Cultivating Carnivorous Plants* by Allan A. Swenson, Doubleday, 1977

*Carnivorous Plants* by Randall Schwartz, Praeger, 1974

**Cushing** (p. 96)

*Zuñi: Selected Writings of Frank Hamilton Cushing*, edited by Jesse D. Green, University of Nebraska, 1979

*My Adventures in Zuñi* by Frank Hamilton Cushing, American West Publishing Company (Palo Alto), 1970

*Zuñi Breadstuff* by Frank Hamilton Cushing, Museum of the American Indian (New York), 1975

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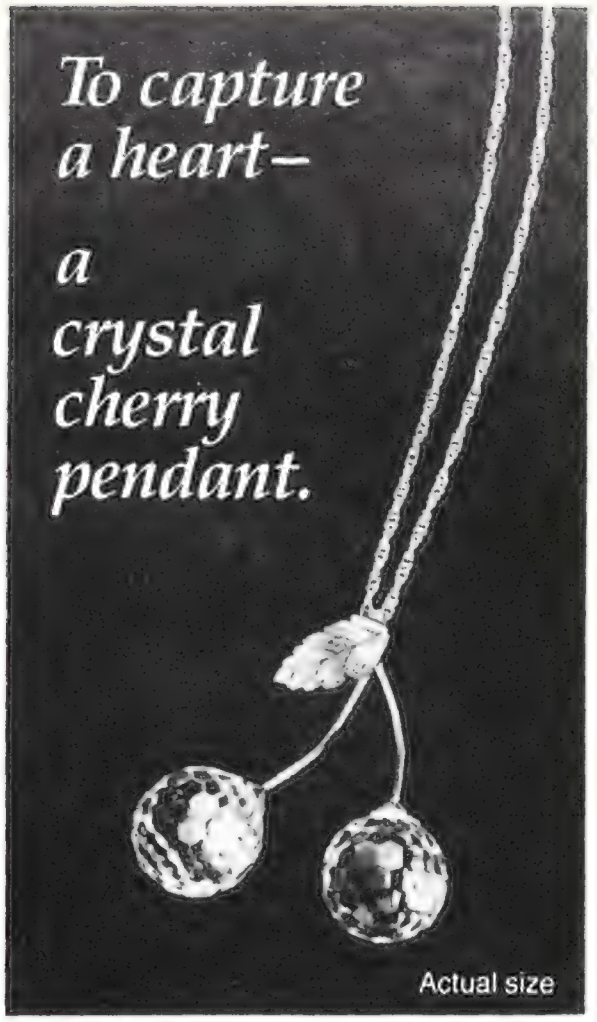


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# *Smithsonian highlights*

*Art of Russia, 1800-1850,* is the big opener at the Renwick this month (see p. 54). And in New York, the Cooper-Hewitt has embarked on a lively program exploring urban open spaces. Summer at the Smithsonian also brings a rich list of continuing special exhibits, some listed below.

Skipping ahead a bit . . . On September 2, or September 3 if it rains, the National Air and Space Museum gets down to some basic flying with the third annual Smithsonian Frisbee Disc Festival. This uniquely entertaining event, noon to 5 P.M. on the field east of the museum, features demonstrations by disc stars, human and canine (see below). Experts will be on hand to teach various tosses, catches, flips and flops. Last year thousands of enthusiasts attended the festival, billed by NASM as "the best-attended, noncompetitive Frisbee event ever."

Dog and disc at Frisbee Festival

## Special August exhibits and events

**Air & Space Museum**
*What Do You See in the Night?* (August 4, 9 A.M.)—Monthly sky lecture discusses lights other than ordinary stars—clusters, dust, gas, pulsars, quasars—and focuses on summer and autumn skies; Albert Einstein Spacearium—8:45 arrival suggested.
*Living Planet* and *To Fly* (daily, every 40 minutes from 10:15 A.M. to 8:15 P.M.)—Short films offering spectacular bird's-eye views of Earth; NASM Theater.

**Cooper-Hewitt Museum** (New York)
*Concerts in the Carnegie Garden* (Tuesdays, 6 P.M.)—Anthony LaGiglia Dance Theater, August 14; Dana Reitz and Dancers, August 28.
*Immovable Objects III, Urban Open Spaces* (through summer 1979)—Lectures, walking tours and on-site exhibitions; symposium, August 8, 7 P.M. (obtain free ticket from museum); free film series, August 7, 21, 6 P.M.

**Freer Gallery of Art**
*Chinese Paintings from the Ch'ing Dynasty* [1644-1912] (through December 15).
*Early Christian Manuscripts* (through November 15)—Armenian works.

**Hirshhorn Museum & Sculpture Garden**
*David Smith: The HM&SG Collection* (through October 28)—Includes 26 sculptures, from the artist's first work in welded metal to the geometric stainless-steel compositions of the early Sixties.
*Directions* (through September 3)—Sculptures, paintings, projects and video pieces reflect contemporary American art.

**National Collection of Fine Arts**
*Art From Chicago: The Koffler Foundation Collection* (through August 12)—An important gift to NCFA of 34 paintings, works on paper, sculpture and collage.
*Childhood: Children in American Art* (through September 16).
**NCFA Traveling Exhibition**
*Contemporary Art from Alaska* (August 15-September 30)—Alaska State Museum at Juneau.

**National Portrait Gallery**
*They Have Made a Nation* (through October 7)—Colorful personalities from Confederate States of America.
*Return to Albion: Americans in England 1760-1940* (through September 16).

**Museum of Natural History (MNH)**
*Spiro Graphics* (through September 9)—Rubbings and drawings of designs engraved on shells found in a prehistoric Indian burial mound in Spiro, Oklahoma.

Unique Daum vases at MHT

**Museum of History & Technology (MHT)**
*Daum: 100 Years of Glass* (through August 26)—Early vases, Art Deco and Art Nouveau lamps, and crystal celebrating this 3,000-year-old material (above).
*Iron Bridge:* 1779-1979 (through Labor Day) (SMITHSONIAN, July 1979).
*Ten Years of Sesame Street* (through Labor Day)—Big Bird comes to the Mall.
*Outdoor Jazz Concerts* (Wednesdays, through August)—The Commodores, the U.S. Navy band's jazz ensemble, performs on museum's Mall terrace, 6-7 P.M.

**Renwick Gallery**
*Art of Russia, 1800-1850* (August 3-November 12)—Exhibit of 144 paintings, graphics and decorative arts, most never before shown in America (see p. 54).
*Buildings Reborn: New Uses, Old Places* (through August 19).
**Renwick Gallery Traveling Exhibition**
*Craft Multiples* (through August 15)—Huntington Galleries, Huntington, West Virginia.

**National Zoo**
*Puppets in the Park* (through August 19)—Free puppet shows instruct children in zoo manners, introduce birds, seals and hippos; daily except Mondays, 10 A.M.-4 P.M., Education Building.
*Films* (through September 2)—Continuous films on zoological topics, 10:30 A.M.-4:30 P.M., Education Building.

## Smithsonian events (tickets required)
(202-381-5157)

**Arts & Industries Building**
*Archaesus Productions* (through September 3)—Innovative theater and mime for children in Discovery Theater, 11 A.M., 2 P.M. daily (202-381-5395).
**MHT's Carmichael Auditorium**
*Into the Ozone* (August 8, 8 P.M.)—Discussion of studies investigating probable shifts in ozone as well as human influence on this protective layer of the Earth, by Donald Heath of NASA's Goddard Space Flight Center.
*The London Yankees* (August 22, 8 P.M.)—Slide-illustrated lecture by biographer Stanley Weintraub on some 19th- and early 20th-century expatriate Americans.
**MNH's Baird Auditorium**
*Treasures from the Kremlin: Royal Taste and Style in Muscovy* (August 1, 6:30 P.M.)—Dr. Edward L. Keenan, Dean of the Harvard Graduate School of Arts and Sciences, gives an illustrated talk on one of the most sumptuous collections of art in the world and shows how royal acquisitions reflected political outlook.
*Judy Chicago and "The Dinner Party"* (August 9, 8 P.M.)—Artist and feminist discusses her monumental sculpture symbolizing women's historic struggles, shows slides of the 39 place settings, embroidered table mats and "Heritage Floor."
*A Celebration of Caribbean Rhythm and Rhyme* (August 21, 8 P.M.)—Collaborating in a unique performance are Victor Brady on the steel piano and actor Elliott Parris with poetry of the islands.

## Radio Smithsonian

This music-and-conversation program is broadcast weekly on approximately 50 stations across the country. For times, consult your local fine arts radio station:
*Remembering Alexander Calder* (week of August 5)—Margaret Calder Hayes talks about her brother's achievements.
*The Art of Glass* (week of August 5)—Artist Dale Chihuly describes how he creates his delicate blown-glass cylinders.
*Einstein's Universe* (week of August 12)—First of two programs exploring Einstein's world; guests include C.P. Snow.
*Einstein's Universe, Part II* (week of August 19)—The influence of Einstein's work on the scientific world.
*Pompeii A.D. 79* (week of August 26)—A look at this civilization preserved in ashes for nearly 2,000 years.
*Master of Electronic Music* (week of August 26)—Composer Morton Subotnick talks about his work, with a sampling of his voice-activated composition, "Sky With Clouds."

## Smithsonian Institution Traveling Exhibition Service

SITES circulates exhibitions to hundreds of cities outside Washington, D.C. To sponsor a show in your community, write to Eileen Harakal, SITES, Smithsonian Institution, Washington, D.C. 20560.
Here are some August openings:

**Littleton, Colorado** (August 4-September 16)—*The First Four Thousand Years: The Ratner Collection of Judaean Antiquities,* Arapahoe Community College.
**Carterville, Illinois** (August 18-September 16)—*Images of Old Age in America, 1790-1977,* John A. Logan College.
**Evansville, Indiana** (August 4-September 2)—*American Agriculture: A Continuing Revolution,* Evansville Museum of Arts and Sciences.
**Mt. Pleasant, Iowa** (August 4-September 2)—*American Agriculture: A Continuing Revolution,* Midwest Old Settlers and Threshers Association.
**Baltimore** (August 4-September 2)—*Subways, An Underground Exhibition,* Maryland Science Center.
**Worcester, Massachusetts** (August 18-September 16)—*Photographing the Frontier,* Worcester Polytechnic Institute, Gordon Library.
**St. Louis** (August 11-September 9)—*Images of Earth from Space,* Museum of Science and Natural History.
**Buffalo** (August 18-September 16)—*Inuit Sculpture,* Erie Savings Bank.
**Old Chatham, New York** (August 18-September 16)—*Shaker Built,* the Shaker Museum.
**Old Forge, New York** (August 25-September 27)—*Ride On!* Art Guild of Old Forge, Community Art Center.
**Chapel Hill, North Carolina** (August 18-September 23)—*Charles Burchfield: The Charles Rand Penney Collection,* University of North Carolina.
**Portland, Oregon** (August 4-September 5)—*Artists' Postcards,* Portland Art Museum.
**Clarion, Pennsylvania** (August 18-September 16)—*Photographing the Frontier,* Clarion State College.
**Eau Claire, Wisconsin** (August 4-September 2)—*American Agriculture: A Continuing Revolution,* the Chippewa Valley Museum.
**Madison, Wisconsin** (August 11-September 9)—*Quintessential Quilts,* State Historical Society.
**Milwaukee** (August 18-September 16)—*Photographing the Frontier,* Mill Road Library.
**Saskatoon, Saskatchewan** (August 4-September 2)—*New American Monotypes,* Mendel Art Gallery.


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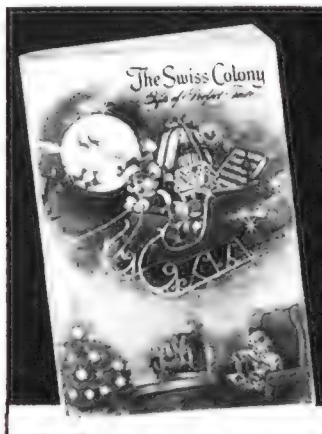


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## Domestic Study Tours

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Desolation and Gray Canyons—September 30-October 10, or October 11-21: White-water trip for the adventurous; explore geology, wildlife and exciting Indian and outlaw history of Green River in Utah.

Archaeological Dig—October 6-13: Join archaeologists in an actual dig in Illinois, supplemented by instruction, lectures, laboratory work and field trips.

Smithsonian Sampler Weekend—October 12-14 or October 26-28: Bring the family for behind-the-scenes tours of specially selected museums with Smithsonian curators and staff.

Asheville, North Carolina—October 19-22: Visit Biltmore, famous Vanderbilt estate, Carl Sandburg's house and other historic homes in this mountain resort during peak of fall foliage.

Florida Keys—October 28-November 4: Explore coral reefs, tide pools and sponge beds with staff at Newfound Harbor Marine Institute on Big Pine Key.

National Air & Space Museum—November 16-18: Curators and staff lead a behind-the-scenes tour of this popular museum and Silver Hill, the restoration and storage facility.

Antiques in Atlanta—November 29-December 2: Weekend program of lectures and field trips on antiques and decorative arts in conjunction with High Museum's annual antiques show.

Christmas at the Smithsonian—December 7-9: Eighth annual Christmas weekend with traditional tree-trimming party and special behind-the-scenes tours including private viewing of gem collection.

Virgin Islands Adventure—January 14-23 or January 23-February 1: Explore the British Virgin Islands by chartered sailboat and learn about the spectacular life of the coral reef.

Washington "Anytime" Weekend: Choose any weekend to visit your choice of Smithsonian museums, spend two nights at Loew's L'Enfant Plaza Hotel or Hyatt Regency Washington, each close to the Mall, and see other sights in the city by Tourmobile. Reservations and payments must be received by the Smithsonian Institution at least ten days prior to arrival.

## Foreign Charter Tours

Scotland*—September 9-23: Edinburgh and beyond—a program of walking tours and special visits in this historic city; visits to castles, abbeys, battlefields and archaeological sites, plus incomparable scenery of rugged mountain glens and rolling hillsides.

Sultans' Treasures*—September 23-October 7: A sampling of Turkey's rich and varied heritage. A five-day program in Istanbul with sightseeing, museum seminars and a visit with a Turkish family followed by excursions to Aegean Turkey or Anatolia. Concludes in Ankara.

Spain*—September 30-October 14: Enjoy the cosmopolitan atmosphere of Madrid for a week of walking tours, museum visits and excursions to historic sites in New Castile. Then sample one of three travel seminars to Santiago, Barcelona or Andalusia for exploration of its history, architecture and way of life.

Japan—October 21-November 6: The heart of historic Japan with extended program in Kyoto and Nara followed by choice of travel to Inland Sea or Sea of Japan. Program concludes in Tokyo with visits to Nikko or Kamakura. (Originates and ends in San Francisco.)

Guatemala—October 31-November 11, November 21-December 2, January 23-February 3, or February 20-March 2: In the company of an archaeologist, visit Tikal, monumental Mayan city of Petén jungle; Copán, Mayan site deep in Honduras; plus Mayan ruins of Quiriguá, El Baúl, Democracia. (Tour originates and ends in Guatemala City.)

Mayan Mexico: The Yucatán Peninsula—November 11-23, December 5-17, January 8-20; or February 5-17: A complete tour of unique Mayan ruins of the Yucatán. (Tour originates and ends in Mérida.)

New Zealand—November 21-December 7 or February 20-March 7: Tour includes Mt. Cook, Te Anau and Milford Sound, plus Auckland, Rotorua, Wellington and Christchurch; also talks on natural history, the Maori heritage, parliament and home visit. (Tour originates and ends in Los Angeles.)

Winter Russia*—December 28-January 11: Leningrad, Tallinn and Moscow plus optional two-day excursion to Vladimir and Suzdal; activities include gala New Year's Eve party and a traditional troika ride; lifeseeing visits to schools, factories or clinics; attend the Russian theater and the circus.

Chilean Highlands—January 11-February 2. Rugged outdoor learning experience for small group. Raft down the Bío-Bío River and hike with a naturalist to glaciers, volcanoes, waterfalls and mountain forests.

Low-cost tours include first-class hotels, most meals, sightseeing, lectures, theater tickets, air fare. *Indicates optional predeparture course will be available.

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When in Washington . . . Associates enjoy the following membership benefits: The **Associates Reception Desk** in the castle is open 10 A.M.-4 P.M. daily for registration, event-exhibit information, orientation publication and the Associates' *Guide to the Nation's Capital and the Smithsonian Institution.* The **Associates Lounge**, open 10 A.M.-9 P.M. daily, is a quiet place to relax in the castle. **The Court**, the members' dining room in the Museum of Natural History, is open Monday through Friday, for breakfast (8:30-10 A.M.), lunch (11 A.M.-3 P.M.) and dinner (4:30-7 P.M.); and weekends, for breakfast (8:30-11 P.M.), brunch (11 A.M.-3 P.M.) and dinner (4:30-7 P.M. For previsit information, send postcard or phone Associates' Reception Center, Smithsonian Institution, Washington, D.C. 20560 (202-381-6264).
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Write Associates Travel for trip brochures: A&I 1278, Smithsonian, Washington, D.C. 20560 or call (202) 381-5635.

# in Washington

## Selected Studies Seminars

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**Man's Quest for Wings**—Sept. 30-Oct. 5: Experts at the National Air and Space Museum highlight achievements and triumphs in the wondrous history of flight. Includes a day's visit at the renowned preservation, restoration and storage facility at Silver Hill to view the finest and most varied collection of airplanes, spacecraft and memorabilia in the world.

**Historic House Preservation**—Nov. 4-9: Preservation authorities share their special "know-how" to help with the challenges of restoration. Participants visit numerous projects successfully completed and underway, including lovely urban houses and country estates.

**Aircraft Restoration: How To**—Sept. 9-13: Internationally known craftsmen of Silver Hill, who have re-created many masterpieces of aviation in the preeminent National Air and Space Museum, offer workshops on the many various techniques used.

**Genealogical Research**—Sept. 30-Oct. 5: (Repeat of popular program).

**American Antique Furniture**—Oct. 14-19: Dealing with the appreciation of antiques, 1650-1840.

**Arts of Imperial Russia**—Oct. 24-28: Visits to Hillwood Museum and the special exhibition at the Smithsonian of paintings from major Soviet museums.

**China: A Cultural History**—Oct. 28-Nov. 2: Prehistory to the enigmas of today, with emphasis on intellectual and artistic traditions and the great philosophies and religions. Includes recent films and tours of the outstanding collection of the Freer Gallery of Art.

**Please send requests for full information on content, accommodations and fees by seminar title to Selected Studies, A & I 1190A, Smithsonian Institution, Washington, D.C. 20560 or telephone (202) 381-6434 for details.**


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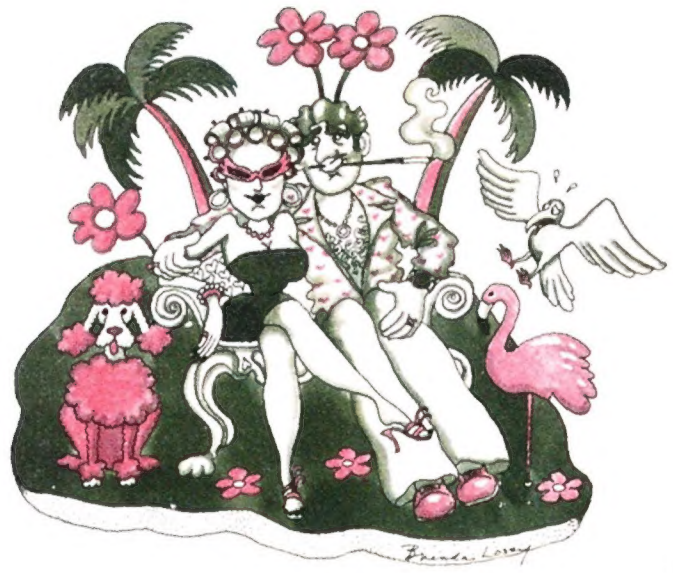
*By Patrick Ryan*

# *A suspect philosophy of lawn-mowing's joys*



While dutifully mowing the lawn, up-and-down, up-and-down, my vacant mind conjectured about how much fuller the divorce courts and the mental hospitals might be if everyone laid down plastic grass, and denied himself the regular therapy of cutting the domestic pasture at weekly, fortnightly or where's-that-scythe intervals. Such an inactive day may well be nearer than anyone thinks, since there are ominous signs of the artificial herbage creeping steadily across the landscape.

Time was when inorganic turf was principally used to cover the playing surfaces of sports stadia. A few years ago, however, its invasion of neighborhood gardens was sufficient to lead *Time* magazine to report that a working couple in Renton, Washington, had paid $3,500 for an artificial garden which needed no watering, weeding or pruning. "The landscaper laid a huge concrete slab, then glued on artificial turf for an instant lawn" and set it about with 31 varieties of synthetic plants.

I had, till now, regarded this home-sweet-home installation of ersatz greensward as just another transatlantic labor-saving compulsion. Then I discovered in a local emporium that man-made grass has penetrated the British market at $11 for a six-by-three-foot strip. So we may yet build a polystyrene Jerusalem in England's green and polyvinyl land. And further mourn with ever-returning spring when lilacs made in Hong Kong last in the dooryard bloom'd.

The soothing grace of living grass of the monocotyledonous family Gramineae is that soon after you've cropped it, it will shoot up again to untidy lengths and require that you spend another brain-gentling hour docilely following behind the mower to cut it down to size.

The psychiatric benison in such solitary endeavor is that, for once in the week, you are operating in closed circuit with yourself. With the drone of the motor cutting off all external communication, you are safely away from the work-aday persecutions of overlords, decision seekers and argument makers. Nobody can invade the rapport between you and your lawn mower. Job progress is immediately visible as the new-shorn emerald strips unroll rhythmically behind you.

For just one golden half-hour in the beleaguered week, you are undisputed master of your verdant fate and captain of your chlorophyllose soul. It is just a foretaste of Shangri-La in suburbia, and a flash of pure Zen without the inconvenience of having your head shaved.

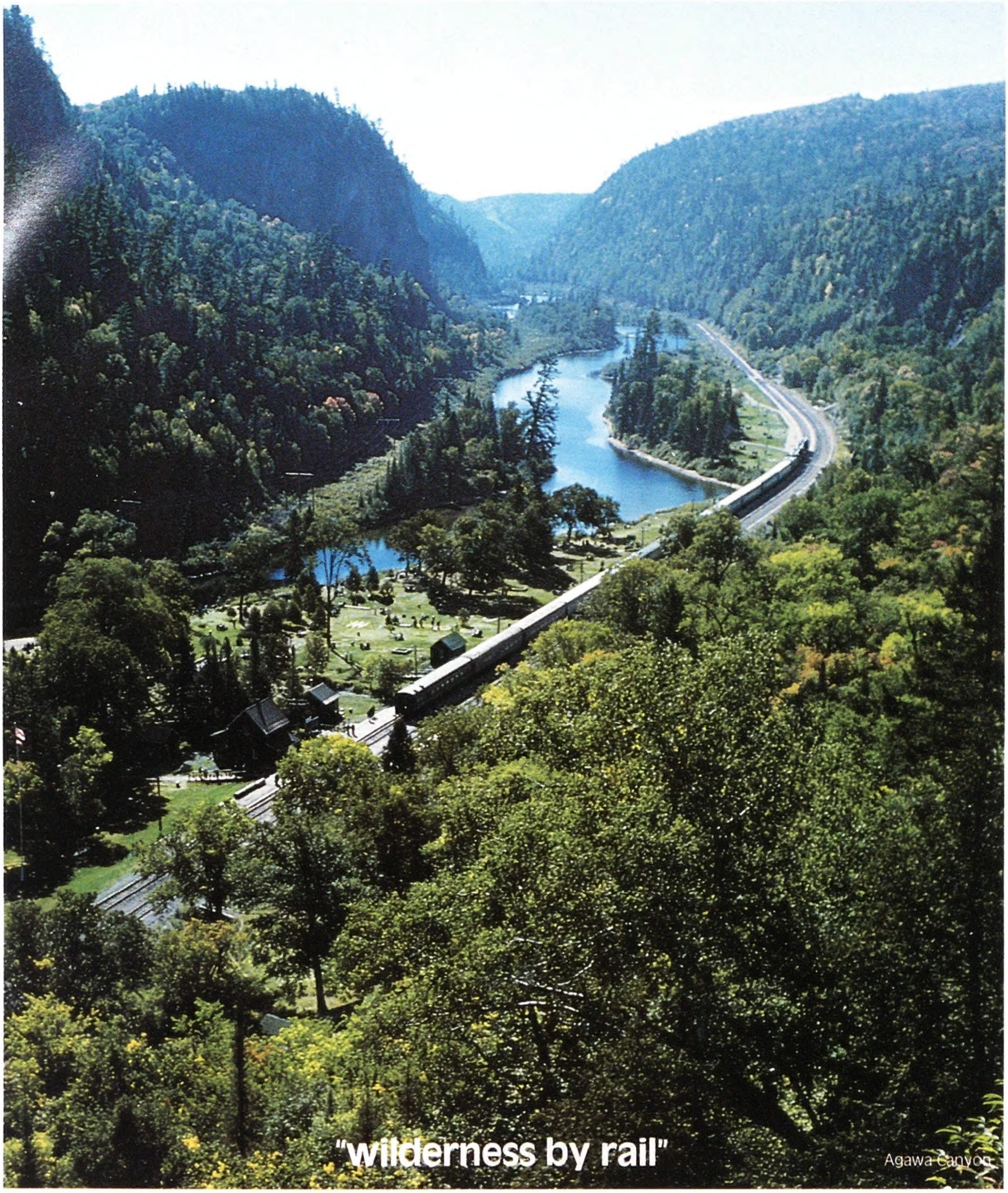
But neither back nor front lawn will be able to bring any such healing bliss if plastic grass advances to cover all. It will just lie there in an unchanging shade of green, inert, sterile, never growing a millimeter in all eternity, incapable of offering any weekly balm to troubled brows. No more the comforting sound of the lenitive lawn mower on the evening air; gone forever the fragrance of new-cut grass; and no birds sing because their beaks are blunted from dipping for worms in the lifeless green carpet.

The phony pasture has also been known to give mankind a sharp twinge or two. When they laid plastic grass at the London Design Center to simulate a rural atmosphere for a New Town exhibition, it was reported that the stuff "stored so much static electricity that there were shocks for any visitor touching a metal fitting." Four humidifiers had to be brought in to reduce the static so that the visiting cabinet minister could declare the exhibition open without risk of collecting a shock fit to loosen his eyeteeth.

Worse befell a championship soccer match in Sweden last year when all 22 players were stunned by a bolt of lightning that struck the metal-based artificial grass upon which they were playing.

Thunder and lightning, of course, were long held to be an expression of divine displeasure, and there might well have been a touch of the wrath of God behind that Swedish visitation. It should not be overlooked that, according to Genesis, the first command God gave to the dry land after dividing it from the waters on the third day of Creation was, "Let the earth bring forth grass." It might be somewhat less than pleasing in celestial quarters to find, after all this time, that upstart primates are replacing heaven-sent herbage with factory-made fibers.

The Almighty also made the first garden on Earth when He "planted a garden eastward in Eden" and "made . . . to grow every tree that is pleasant to the sight, and good for food." So it behooves anybody who has fitted out his garden with polymeric shrubs and thermoplastic flowers to check that his house has a good lightning conductor. And also to take note of the fate of the $74,504 worth of plastic trees and plants the County Board of Los Angeles once installed along some two miles of roadway. Local nature lovers forthwith chopped down and sawed up many of the trees. And others were destroyed by fire, an act of open-air fire making which might well have been the handiwork of One experienced in the supernatural production of burning bushes.

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